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Observations on the Bionomics of Strongyloid Larvae in Pastures

I.—The Duration of Infection in Pasture Herbage

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Introduction.

The diseases caused by nematodes of the super family Strongyloidea are among those of the first importance to stock owners in this country and indeed throughout the world. From an economic point of view parasitic gastritis is admittedly the worst disease in sheep; parasitic enteritis of horses is the most generally harmful disease of young horses; husk is one of the two or three most troublesome diseases to breeders of cattle, parasitic gastritis in cattle causes very considerable loss in some parts of the country, probably being much more prevalent than is generally supposed; and strongylosis of poultry and game birds not infrequently gives rise to a high rate of mortality and heavy financial loss. All of these important diseases are caused by strongyloid nematodes, and constitute a major obstacle in the way of the development of grassland farming that the progress of veterinary science has so far been unable to overcome. Although the text-book information on the life history of the responsible parasites would certainly suggest to the layman that sufficient is known for a thorough understanding of the development of these diseases such is not the case. The worms responsible for parasitic gastritis of sheep and cattle, and parasitic enteritis of horses are almost invariably present wherever the suitable hosts are kept, their eradication being quite out of the question, owing to the present lack of knowledge and the inadequacy of control methods. This ubiquitous distribution implies a wonderful tolerance on the part of the host and the numbers of parasites that may be carried by a perfectly healthy animal is a matter of surprise to anyone who has not previously searched for the worms in lambs at an abattoir, or in horses which have died from causes other than strongylosis. There is a border-line of infestation, however, above which a derangement of health results, sometimes leading to the death of a large proportion of the flock or herd, and the investigation of the cause of these diseases largely concerns the factors which influence the numerical increase of the parasitic worms.

The investigation of these factors involves the consideration of two distinct environments; the host, in which the parasitic stages of the worms are passed, and the outside world in which the worms go through the several stages of their free life. The first of these two environments is now being studied intensively by the several workers engaged in the investigation of helminthological immunity, and a number of interesting and helpful additions to our knowledge have been made through their efforts. Partly as a result of the success of this new line of investigation, however, the study of the free life of the parasite has received comparatively little attention although the importance of work on the free-living stages is obvious to anyone who makes a careful enquiry into the circumstances leading up to outbreaks of this group of diseases as they occur under farming conditions. To quote an example, an observation made by Mönnig, in 1930, on the resistance of the embryonated egg of *Trichostrongylus axei* to dryness enabled Taylor (1934a) to give a satisfactory explanation for the epidemic of parasitic gastritis which occurred in sheep during the winter of 1933-1934 in Great Britain.

Further examples are seen in Taylor's (1934b) report of enquiries into a series of outbreaks of parasitic gastritis which led to several tentative conclusions of a rather unorthodox nature and suggested there to be a very great difference between the suitabilities of various field conditions for larval development. It was recognised that the residue of infection in a field which has been free from sheep for weeks or months may be sufficient to cause disease apart from any addition to the infection on the pasture by the newly introduced sheep which ultimately become diseased; marked differences in the larval concentration in different parts of the same field were observed and the much greater suitability of conditions for larval development on arable than on pasture land was recognised.

These conclusions are regarded as only tentative, being of the nature of uncontrolled field observations, observations that require to be repeated under experimental conditions, but the evidence which was collected at that time clearly indicated the enormous differences between the suitabilities of various field conditions for the development of strongyloid larvae and the probabilities for the ultimate appearance of disease in the animals grazing there.

An enquiry into the detailed bionomics of the free-living larvae of these parasitic worms relative to the causes underlying the development of parasitic gastritis concerns everything that influences the hatching of the eggs of the parasitic worms, their successful development to the infective-larval stage, the longevity of the infective larvae in the pasture and the ultimate transmission of the larvae to the host animal.

Up to the present time the investigations into this aspect of the study of strongyloid diseases have been carried out almost exclusively in laboratories, sometimes under conditions in which an attempt has been made to simulate what occurs in the pastures but frequently under very unnatural conditions, yielding experimental results which may not apply to conditions in the field. However carefully an investigator may try to imitate the natural environment, his ignorance of what the natural conditions really are not infrequently leads to the exclusion of important factors, so severely discounting the value of the observations or rendering them useless for practical purposes.

In the enquiry which has been carried out at Weybridge during the past three years, therefore, an attempt has been made to avoid this danger by studying the larvae as they occur in the pastures where the infected animals are actually grazing and on small patches of herbage grown in boxes in the pastures. One or two interesting points have come to light during the course of this work on which it is proposed to report in a series of articles in this journal.

No. I.—The Duration of Infection in Pasture Herbage

The long life of ensheathed strongyloid larvae in damp air at room temperature or in a cold room is well known. Although their longevity does not quite equal that of some of the eelworms of plants which may remain alive for more than ten years, nor of the infective eggs of Ascaris some of which are still alive in the cold room of this laboratory after eight-and-a-half years, they can remain active in a sheltered environment in a laboratory for periods exceeding two years. A few larvae of *Trichostrongylus axei* were found to be active after having been kept in the cold room at this laboratory at a temperature varying between 36° F. and 40° F. for two years and two months. Enigk (1934) reported having found strongyloid larvae to be still alive after having been kept on a slide in a dry state for over four years, an observation which, however, it has not been found possible to confirm at this laboratory.

There are, however, very few records of observations made on the longevity of these larvae in the field. Ransom (1916) found that a field which had been left vacant for seven months still contained infective larvae. Griffiths (1937) found that the larvae of *Ostertagia circumcincta*, *Nematodirus filicollis* and *Trichostrongylus colubriformis* retained their infectivity throughout a Canadian winter in the pasture on which he made observations, the temperature having ranged from 52·5° F. down to −15° F., but Zovadowsky and Vorobiova (1934) reported that exposure in the open during four winter months at Moscow killed 97 to 99 per cent. of trichostrongyloid larvae and probably rendered the remainder too weak to cause infection. Raffensperger (1931) reported observations on the longevity of *Strongylus* larvae in the pastures in Montana where he found them to remain alive in horse faeces and in the surrounding herbage throughout two winters and one summer during which the temperature ranged from −38° F. to 106° F.

From enquiries into the history of outbreaks of parasitic gastritis, Taylor (1934a) concluded that the trichostrongyloid larvae can retain their infectivity *en masse* throughout the winter months on arable ground in Great Britain in sufficient numbers to cause disease in the spring, even if the sheep are penned on the ground in such a way as to prevent auto-infestation from taking place through addition to the larvae already there. This was confirmed by

an experimental observation at Weybridge (Taylor, 1937).

These observations are of interest in showing the extraordinary vitality of the resting infective stages of strongyloid and trichostrongyloid larvae, but they only give a part of the information which it is desirable to have, as in addition to information on the maximum longevity of the larvae it is obviously important to know something of the rate of their disappearance, the proportion of the larvae that survive for the maximum length of time, whether deaths begin early and occur at a more or less even rate throughout the survival period, or whether the rate of mortality among the larvae is particularly heavy at the beginning or end, or at any other time during the period of survival.

The following is an account of some investigations into the rate of disappearance of infestation from pasture herbage.

Method of the Investigation

The investigation was carried out on grass grown from seed in boxes of sterilised soil and kept in a pen screened by wire netting against interference by birds and surrounded by a small concrete trench filled with a strong salt solution to protect it from slugs and snails.

The wooden box in which the grass was grown measured 28 inches square and four inches deep, the surface of the soil being divided into 49 equal squares of four-inch sides by strips of zinc sheeting, two inches wide, which were pushed into the soil until a quarter-of-an-inch projected above the surface.

When the grass had grown to a height of two or three inches the soil was sown with infective strongyloid larvae, which were suspended in 1 c.c. of water and carefully pipetted between the blades of grass.

For the recovery of the larvae the grass was cut close to the surface of the soil with a pair of scissors, picked up with forceps and placed in about 50 c.c. of water in a large test tube where it was shaken in three successive changes of clean water that was poured off through a small screen and allowed to stand for some hours; after this the top part was drawn off and the sediment containing the larvae examined under a dissecting microscope, the strongyloid larvae being counted as they were picked out with a fine pipette. If large numbers of larvae were present the sediment was diluted and the larvae counted in only a portion of the whole.

The results of the observations made on five of these boxes are recorded in the following graphs.

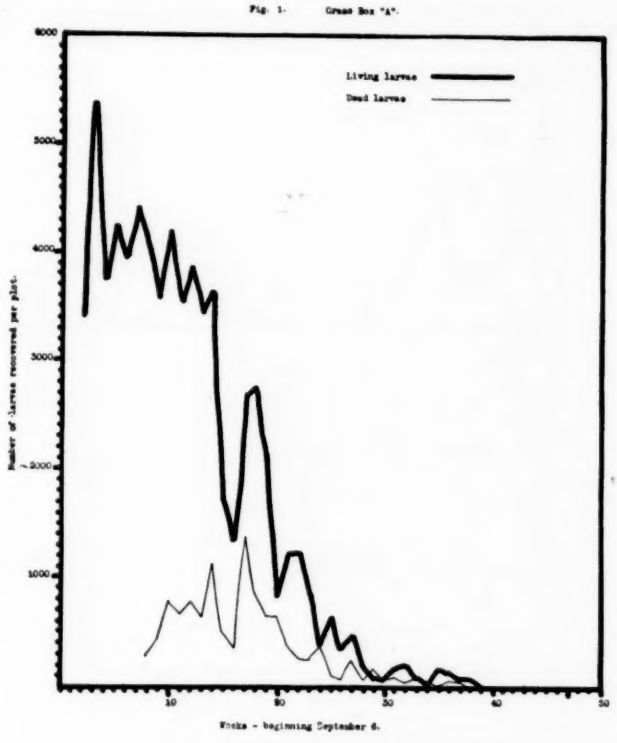


Fig 1.—Grass Box "A."

20,000 mixed infective trichostrongylid larvae of ovine origin were placed on the soil surface in each of the 49 squares in this box on September 6th. Grass was cut from the first square fourteen days after the larvae had been placed there and the remaining 48 squares were cut at weekly intervals, up to and including the fiftieth week. Counts of the number of dead larvae were not made until the tenth week and afterwards.

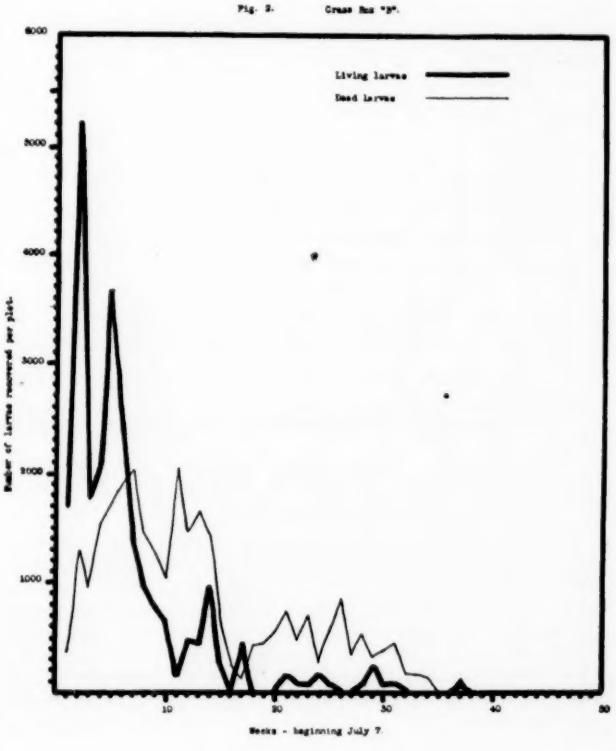
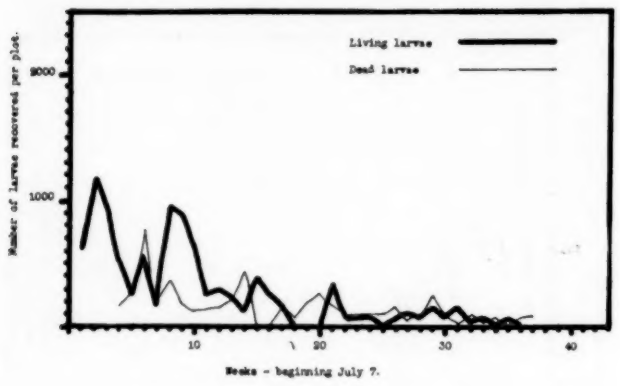


Fig. 3. Grass Box "B".



FIGS. 2 AND 3.—GRASS BOX " B."

13,000 Strongyloid larvae cultured from horses' faeces were placed on the soil surface of each of the 49 squares on 14.7.37, the first square being cut on the following day and grass cut and collected from the remaining squares at weekly intervals. The first collection was thus made on the day after the larvae had been placed in a vigorous and healthy condition on the surface of the soil and it will be noticed from the first point on graph No. 2 that over 300 larvae (other than *S. vulgaris*) were found to have died during the first 24 hours. There were found to be some 2,000 *Strongylus vulgaris* larvae among each lot of 13,000 and as the larvae of this species is easily recognised a separate record was kept, the two counts being shown separately on the two graphs Nos. 2 and 3.

The *S. vulgaris* which were recovered are shown on graph No. 3 and in making a comparison with the strongyloid larvae other than *S. vulgaris* shown on graph No. 2 it will be seen that this species appear to be more resistant; dead larvae did not appear until the fifth week and the living larvae did not disappear so rapidly as in the other mixed species.

Fig. 4. Grass Box "C".

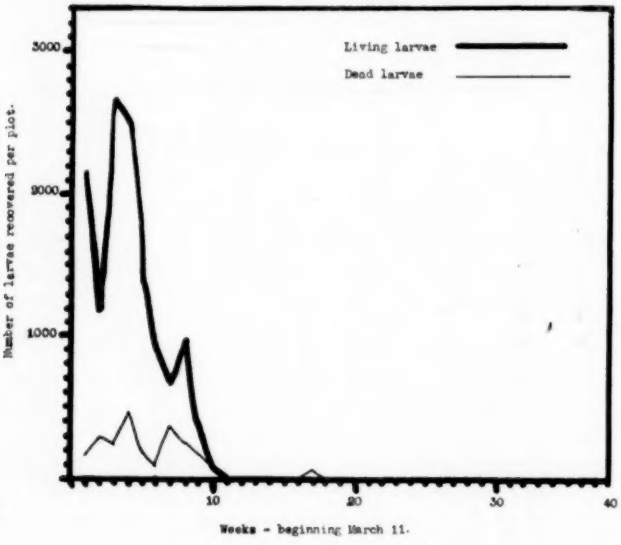


FIG. 4.—GRASS BOX " C."

The squares in this box were sown with 5,000 infective larvae of *Trichostrongylus retortaeformis* from the rabbit on March 18th and collections of grass made at weekly intervals thereafter up to the 40th week. Dead larvae again appeared at the first collection, but the most noticeable feature of the results obtained from this grass box is the rapid and complete disappearance of the living larvae which seem to have died at a uniformly rapid rate, none having been found after the 11th week.

FIG. 5.—GRASS BOX " D."

13,000 infective larvae of *T. retortaeformis* were placed on the soil surface of each 4-inch square on May 25th and grass subsequently collected daily from all of the 49 squares. The larvae were seen to disappear even more rapidly from this box than from Box " C "—probably due to observations having been carried out in warmer and dryer weather. Squares Nos. 1 to 7 were cut a second time to ascertain whether any larvae might have climbed there after the first cutting but none were recovered, either dead or alive.

Fig. 6. Grass Box "E".

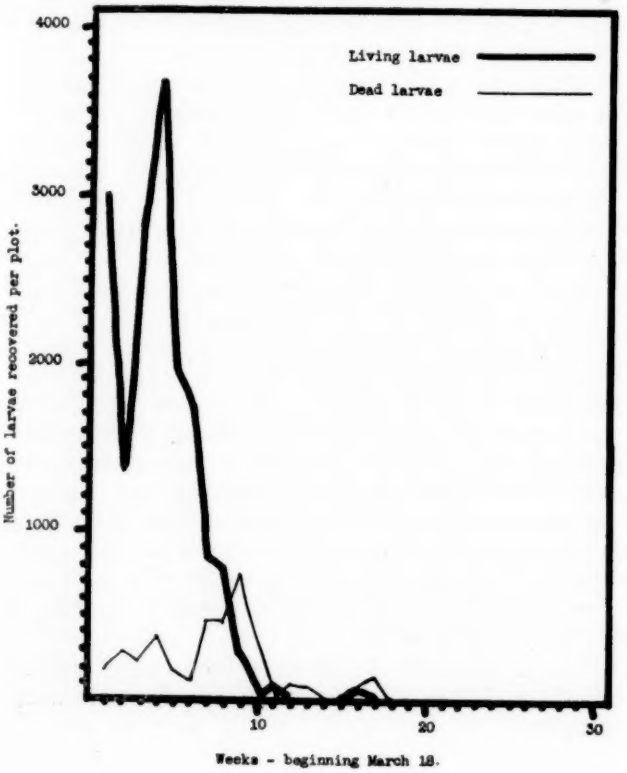


Table I showing the number of living and of dead trichostrongyloid larvae on the upper three-quarters of an inch of blades of grass after a short period of exposure.

Period of exposure on the grass in days.	Number of larvae found on top three-quarter inch of one blade.			
	Grass in Laboratory.		Grass in field.	
	Alive.	Dead.	Alive.	Dead.
1	62	1	—	—
2	180	62	—	—
3	52	41	18	15
5	3	33	118	64
6	3	41	29	68
7	—	23	5	37
8	1	88	—	26
13	—	46	—	45

OBSERVATIONS ON THE LONGEVITY OF LARVAE ON EXPOSED BLADES OF GRASS

The early death of some of the larvae as seen to occur in some of the above reported observations was very surprising and in searching for a reason it was thought possible that the first to die are those which climb highest up the blade of grass and are most exposed to bright sunlight and to the drying effect of winds. Some observations were therefore carried out to ascertain whether this might be so.

Two small tufts of grass, each consisting of some 50 blades or so, were planted in two small plant pots of moist sterile sand. A large number of mixed infective trichostrongyloid larvae of sheep origin were then placed on the surface of the sand, and the whole left to stand over night in a special apparatus used to cause the formation of a dew so that the larvae might have the opportunity of climbing on to the grass.

On the following day the two pots of grass were taken out of the dewing box, one being placed in an exposed part of the open field, and the other in the window of the laboratory where it was exposed to direct sunlight.

The upper three-quarters of an inch of a blade of grass was removed and placed in water on each of the following days, the larvae being examined 24 hours later to ascertain how many were alive and how many were dead.

The results of these examinations are shown in Table I (*above*).

Fig. 6.—Grass Box "E."

9,000 infective larvae of *Graphidium strigosum* were placed on each 4-inch square of this box on March 18th and grass collected at weekly intervals thereafter from each of the 49 squares in turn. The results are seen to be very much like those obtained for *T. retortaeformis* in that there is a relatively sudden disappearance of living larvae.

This shows the surprising rate of mortality among the larvae exposed on the upper parts of the blades of grass, half of the larvae having died after only three days, and at the end of a week all of the larvae having been found dead.

It was interesting to note on the first morning when an examination of the larvae was carried out that a number of *Strongyloides* larvae were also present, having climbed on to the grass along with the trichostrongylid larvae, but that in each instance they were all dead.

Having ascertained in what position many of the short-lived larvae are to be found in the grass the examination of the two tufts was carried out in a slightly different way in order to ascertain where the long-lived larvae might be found. For this purpose the outside blades, the inside blades and the stalks, between the lower blades and the surface of the sand, were examined separately, the result being shown in Table II (*overleaf*).

The results obtained from the second series of observations appear to suggest that the larvae which live for the longest time are those nearest to the soil and situated on the stem of the grass. The results also suggest that larvae continue to climb from the soil on to the stem and some of the lower leaves as, after having been absent from the stem for five successive collections they appeared on the next three occasions, in the grass which had been exposed in the field only, that is, where dew would fall, and not on the stems of grass kept in the laboratory where there was no dew.

It seems probable therefore that the longest lived larvae are those which remain in the moistest microclimate on the lowest parts of the herbage nearest to the soil, and that some of them may remain for a time actually in the soil and migrate on to the herbage plants at some later time.

Table II showing the numbers of living and of dead trichostrongyloid larvae on the various blades of the shoot of grass and on the stem below the lower blades. On each occasion three shoots were examined.

Period of exposure on the grass in days.	Number of larvae recovered from various parts of a shoot of grass.											
	Grass kept in the laboratory.						Grass kept in the field.					
	Lower Blades.		Upper Blades.		Sheathes.		Lower Blades.		Upper Blades.		Sheathes.	
	Alive.	Dead.	Alive.	Dead.	Alive.	Dead.	Alive.	Dead.	Alive.	Dead.	Alive.	Dead.
14	10	1,730	—	130	100	2,250	—	460	—	57	60	2,250
21	—	12	—	570	—	—	—	245	10	740	40	760
28	—	510	—	—	20	1,160	—	67	—	9	9	57
35	—	730	—	—	20	12	20	550	—	6	4	86
42	—	237	—	2	—	74	22	5	1	—	447	93
49	—	1,820	—	1	—	34	300	950	—	4	200	215
56	—	285	—	11	—	36	185	50	8	3	507	56
63	—	1	—	1	—	—	32	49	—	1	55	43
70	—	46	—	—	—	6	—	13	—	—	113	85
77	—	12	—	—	—	1	—	—	—	—	132	290
84	—	17	—	—	—	2	4	24	—	—	73	130
91	—	—	—	—	—	1	80	185	—	—	35	632
98	—	—	—	—	—	—	5	82	—	—	6	79
105	—	2	—	—	—	—	23	25	—	2	34	21
112	—	23	—	—	—	6	—	310	—	—	6	129
119	—	—	—	—	—	—	—	21	—	—	—	13
126	—	—	—	—	—	—	2	4	—	—	3	8
133	—	—	—	—	—	—	—	10	—	—	3	2
140	—	—	—	—	—	—	—	—	—	—	—	55
147	—	—	—	—	—	—	—	3	—	—	—	2
154	—	61	—	—	—	—	—	12	—	—	—	8

Discussion

The examination of the result graphically presented in figures 1 to 6 enables one to arrive at a tolerably clear conception of the rate of disappearance of the infective larvae from the herbage.

From the published reports of laboratory observations on the longevity of infective strongyloid larvae the infestation of a field might have been expected to remain for a long time at a high level before coming to a sudden and rapid decline such as is suggested in Figure 8. Or, taking into consideration the data on the adverse effects of sunlight and dryness a gradual diminution of the infestation might have been expected from the end of the fourth or fifth week, as indicated in Figure 7. The observations here recorded and summarised in Figure 9, however, show that a very high rate of mortality occurs during the first few weeks and that it is only a small proportion of the larvae which remain alive for any considerable period.

The early death of the majority and the long life of a small minority might appear to have reference to the varying longevity of the different species of larvae where a mixed culture has been used in the observations, but the results obtained with a pure culture of *Trichostrongylus retortaeformis* as represented on Figure 5 show that the same mortality rate obtains where a single species has been used.

Fig. 7.

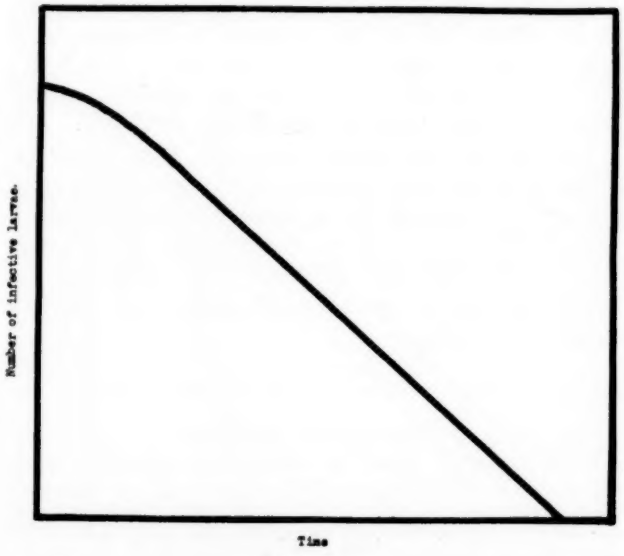
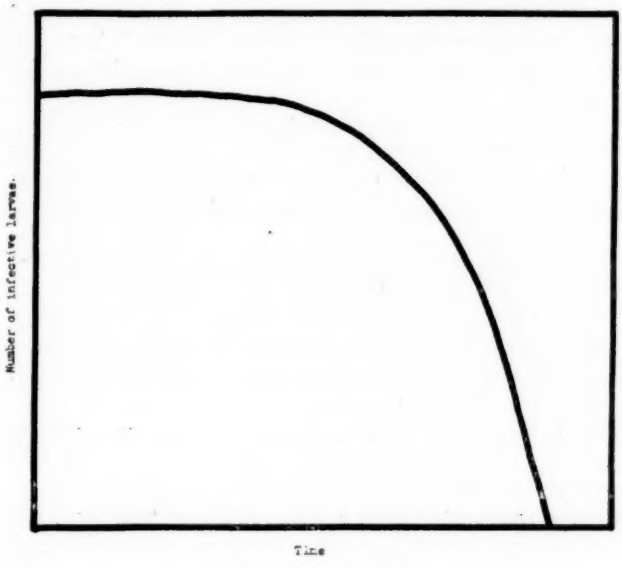


Fig. 8.



FIGS. 7 AND 8.

Showing two alternative theoretical rates of the disappearance of living larvae from a pasture, based on an even death rate among the larvae in the one instance, and an even longevity in the other.

Fig. 9.

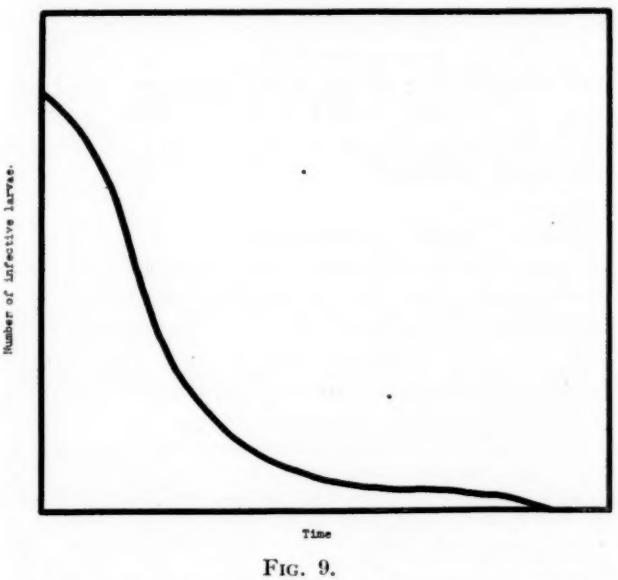


FIG. 9.

Showing the actual rate of the disappearance of living larvae from a pasture.

The rapid disappearance of living larvae in the early part of the observational period is also indicated by the early appearance of dead larvae. Observation on grass boxes "B" and "D" show that some of the larvae actually died during the first 24 hours' exposure on the grass and in most of the observations dead larvae were found at the first examination of material, rapidly increasing in numbers with the succeeding eight or ten collections.

The results obtained from some of the grass boxes actually show that as many larvae may die during their first week on the herbage as are able to survive beyond half of the average length of life.

The reason for the early disappearance of a majority of the larvae is shown by the subsequent observations on individual shoots of grass, revealing the very high rate of mortality among the larvae which climb on to the exposed parts of the plant, and the longer life of those which remain in the moister microclimate on the lower leaves and on the stems, near to the ground. This suggests that the longevity of the larvae may be very different in different kinds of herbage plants varying with the facilities which the structure of the plants provide for the larvae to climb into exposed positions and is a point which calls for further investigation.

An examination of the figures shown for the dead and living larvae on the same date reveals that only in one or two instances does the sum of dead and living larvae recovered from the grass equal the maximum number recovered at the first or second collection, showing that larvae become dislodged from the herbage and lost. As dead larvae may fall off or be washed off by rain in this way, it is probable that living ones are similarly removed and may or may not regain the herbage at a later date. This point has been the subject of special observation and will be discussed at a later date.

The discrepancy between the relative numbers of dead and living larvae recovered from the grass boxes used in the first part of the work, and from the isolated tufts of grass grown in small plant pots of moist sand is probably to be explained by the relatively sheltered situation of the blades of grass in the boxes as compared wtih those in the pots, and perhaps it also has reference to the dry weather which prevailed during the time that the later observations were made. The death rate would therefore be higher among the larger number of larvae that climbed on to the isolated tuft of grass in the pots and as, at the same time, there was less rain or heavy dew to wash the dead ones away a larger number were found at examination.

The rapidity and efficiency of the ascent of the larvae on to the grass is also clearly indicated in these observations, results shown in figure 5 being the most striking in this respect. The estimated number of larvae recovered from the grass in this box, only 24 hours after they were placed on the soil surface, actually exceeded the estimated number originally placed there.

That the proportion of the larvae recovered from this box was considerably higher than from some of the other boxes probably resulted, in part at least, from the thicker growth of grass which happened to be there and provided more stems for the larvae to climb on to.

Variation in the longevity of the larvae of different species was to have been expected, and is shown in the results obtained; *Graphidium strigosum* and *Trichostrongylus retortaeformis* appear to have a comparatively short life as compared with *Strongylus vulgaris* the longevity of which was even greater than that of other red-worm larvae with which it was mixed. The effect of the weather, however, which has still to be investigated, is probably very considerable, and the rates of mortality may prove to be very different under varying atmospheric conditions.

The data which have been collected in these observations apply only to the infective larvae which are already present on the ground and in the herbage and have no concern with the development of the eggs or first and second stage larvae in the faeces, so that they only represent the latter part of the story of what happens to larvae in the pasture.

The interesting practical point which emerges from the observations is the high rate of mortality of the infective larvae as soon as they migrate into the herbage and that it is only a small minority of the total larvae reaching the third stage which survive for any considerable time.

Field observations on the occurrence of parasitic gastritis (Taylor, 1934 and 1937) have clearly shown, however, that a pathogenic infestation may survive for several months. In these instances either the infestation of the pastures has been extraordinarily heavy so that the small proportion of infective larvae which survived has been sufficient to cause disease, or some other factor connected with the weather, the nature of the herbage or the soil surface similar to the difference between arable land and pasture land, has been responsible for the survival of a greater proportion of the larvae. Future investigation may reveal the determining factors.

The rate of the growth of herbage during the period in which a pasture is rested has also been found to have a marked influence upon the intake of larvae by grazing animals and this will be dealt with in a later communication; it is considered, however, that the observations here reported in demonstrating the short life of the majority of infective larvae in herbage have shown one of the reasons for the benefit derived from the frequent resting of pasture and may help towards the more rational use of this aid in the control of the strongyloid diseases of grazing animals.

Summary

Observations on the longevity of strongyloid larvae in grass grown in boxes and kept in the open field have given the following results:—

(1) The larvae ascend the herbage rapidly and efficiently. In one instance the estimated number recovered from a plot of grass exceeded the estimated number placed on the soil surface only 24 hours previously.

(2) The rate of mortality among larvae which have just climbed on to the herbage is very high during the first few weeks but decreases as time goes on. It is only a small minority that manage to survive for anything like the maximum period.

(3) Some of the infective larvae die during the first 24 hours on the herbage.

(4) Results obtained from one of the grass boxes showed that as many larvae died during their first week on the herbage as were able to survive beyond half of the average length of life.

(5) The shortest-lived larvae are those which climb high on to the exposed leaves, and the longest-lived larvae are found on lower leaves and particularly on the leaf sheathes near to the ground.

(6) Dead larvae disappear from the herbage, either falling off or being washed off by rain. Presumably this also applies to living larvae.

(7) These observations suggest that considerable benefit may result from resting a pasture even for a few weeks during which time a considerable reduction in the number of larvae may have occurred.

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SOME ASPECTS OF FOOD INSPECTION*

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There are many aspects of food inspection, but for the purposes of this short paper, I classify inspection under three headings:

(1) Inspection of the materials and methods of preparation at the source;
(2) Supervision over the handling of food;
(3) Condition of food at the time of sale.

A food may be of the highest quality at the source and prepared in an ideal manner, but it may be subsequently handled in such a way that it becomes imperfect, or unsafe for human consumption at the time of sale.

On the other hand, a food may be of an inferior quality at the source, but it may be prepared and handled by special means so that it claims a higher standard, or may be made safe.

Again, a food may be of a high standard, handled in a proper way, but although at the time of sale it may be safe, it is not in just the right condition for consumption. I refer in this last instance more particularly to the correct ripening of fresh meat, a subject in which I am much interested.

In the control of food inspection the more important factors are:—

(1) The prevention of transmission of diseases of animal origin to man;
(2) The prevention of contamination of the food during, and after preparation;
(3) The detection of other conditions, of which there is no direct evidence of their harmfulness, but which render the food unmarketable and certainly unappetising.

The following is a classification under which meat may be injurious to man:—

(1) The food, at the source, may contain pathogenic bacteria or worm parasites which are transmissible to man;
(2) The food may become contaminated with those infective organisms during its preparation and handling;
(3) The food may be injurious on account of the presence of chemical substances;
(4) The food may be perfectly sound for consumption, but injurious on occasion on account of the idiosyncrasy of the consumer;
(5) The psychological effect of certain foods on the consumer. In this connection it is interesting to note two cases that have come to my notice:

(*a*) An individual, who was quite healthy and had good physique, purchased two cakes. He was hungry and consumed one cake rapidly. On breaking the second cake he found worms in it. He immediately became violently sick, although there was no evidence that there were worms in the first cake.

(*b*) A young boy and his grandmother purchased a pot of jam, consumed three-quarters of the pot for supper and went to bed. The next morning they proceeded to have more jam for breakfast, but found a dead mouse in it. Both of them became ill. On examination of the pot containing the jam and the mouse, it was evident that the mouse had got into the jam during the night.

The question occurs to me what was the cause of illness here if not a psychic influence.

Before dealing with the different classes of foods, the subject of "food poisoning" might be considered at this stage. Years ago "food poisoning" was considered to be "ptomaine poisoning." Ptomaines are formed in protein foods as the result of protein decomposition. Savage, in 1920, in his instructive publication stated that "the poisoning ptomaines are produced only in the later stages of putrefaction" and that "no one would be rash enough to eat food in such a condition." He also states that the term "ptomaine poisoning" is clearly incorrect and misleading and it is to be hoped that it will be speedily relegated to the limbo reserved for unsubstantiated theories.

It was found that in so-called ptomaine poisoning the food in many instances contained organisms of the Salmonella group, so that food poisoning became recognised as being caused by food poisoning bacteria. Later work failed to reveal these organisms in a considerable number of outbreaks and it was then suggested that these outbreaks were not caused by these bacteria but by the toxins which they generated in the food, the organisms themselves being destroyed by cooking. There is no adequate confirmatory evidence of the formation of specific exotoxins by members of the Salmonella bacteria. These organisms are destroyed by heat at 60° C. for half an hour, but their toxic products are very resistant to heat even up to 100° C. In some cases they are found to resist a temperature of 100° C. for half an hour. It was then concluded that the power of resistance to heat possessed by these toxic products explained the fairly numerous outbreaks which were due to food material which contain no living organisms of the Salmonella group.

Attention was then drawn to certain outbreaks of poisoning which proved to be due to the presence in the food of toxins formed by staphylococci.

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*Paper read before the Section of State Medicine, Royal Academy of Medicine, March 4th, 1938. Reproduced by courtesy of the author and of the Editor, from *The Irish Journal of Medical Service*. Sixth Series, No. 148.

The inference to be drawn from further work on this subject was that many organisms, non-pathogenic in themselves, when allowed to multiply under favourable conditions in suitable types of foodstuffs caused the appearance of toxic substances having an irritating effect on the human gastro-intestinal mucosa. To quote Topley and Wilson: "The epidemiological, and more recently the bacteriological, evidence seem to us, however, to be becoming increasingly strong in favour of this view. The pendulum is in fact slowly swinging in the direction of the old 'ptomaine' theory, with the distinction that the poisons now regarded as responsible are not the result of advanced protein decomposition, but are products of the growth in the food of those bacteria which are able to proliferate enormously without greatly altering the appearance and taste of the food. These products are most probably the autolysed bacterial bodies themselves." In summing up, these authors say that bacterial food poisoning may be due to:—

(1) infection with living Salmonellae, or occasionally dysentery bacteria,

(2) intoxication with substances, whose nature and mode of origin is as yet imperfectly understood, which are formed as the result of undue bacterial multiplication in the food.

This new view on food-poisoning raises an important question and modifies the view hitherto held as to its origin.

Of 112 outbreaks in the British Isles, 39 were shown to be caused by bacteria of the Salmonella group. In 100 later outbreaks recorded, the organisms of this group were isolated in only 20 instances. The food incriminated had generally been meat, milk, fish and eggs; vegetables and cereals were less commonly and fruits rarely implicated. It is important to note that such food may and generally does appear quite normal to ordinary inspection. The best example of this to quote is that a meat inspector in Belgium judged suspect sausages as fit for consumption and, to back up his opinion, he ate some of them. He then developed illness and died in five days, and from his viscera and from the sausages the *Bacillus enteritidis* was isolated.

There are quite a number of organisms of the Salmonella group. At least 12 types have been identified as the causes of food-poisoning outbreaks in Britain. The most important of these, not altogether on account of the frequency of the outbreaks they caused but due to their associations with animals, are:—

(1) *Bact. typhi-murium,* known as the Aertrycke bacillus, and found in rodents, principally mice.

(2) *Bact. enteritidis,* known as Gaertner's bacillus, and found also in rodents, principally the rat.

(3) *Bact. suipestifer,* which is common in the pig.

(4) *Bact. enteritidis,* var. *dublin,* which is found in calves.

(5) *Bact. derby,* occasionally found in the pig.

Another organism of this group called *S. anatum,* derived from ducks and duck-eggs, has been incriminated in other countries.

In addition to the above types of Salmonellae, several others have been identified in other countries causing food poisoning.

"In 68·8 per cent. of the 112 British outbreaks recorded by Savage (1920) in which animal food was the vehicle, the meat was derived from the pig or the ox. Experience in other countries has been much the same. Meyer (1929), for example, reports that, in Germany between the years 1923 and 1928, out of a total of 281 outbreaks in which the animal source of origin was determined, 168 were due to cattle, 60 to pig, and 49 to horse flesh. In 137 other outbreaks sausage meat was the cause, and in a further 75 outbreaks meat of various types had been used." (Topley and Wilson.)

On the Continent "emergency killed animals" have caused a large number of outbreaks, the infection being derived from the meat of such animals, but in England most of the meat-poisoning outbreaks have been due to contamination of the meat after slaughter. Milk-borne outbreaks of food-poisoning are also recorded, either from infected udders of cows or by milk being contaminated with infected faeces from the cows.

In the British Isles only three small outbreaks of botulism have been recorded—one in Scotland and the remaining two in London. The organism responsible for botulism is a spore-bearing anaerobe which multiplies in food under anaerobic conditions before it is consumed, when it produces its exotoxin. The spores of this organism may withstand boiling for half an hour to 22 hours and a temperature of 120° C. for as long as 20 minutes. Strong brine is unfavourable to its development. Nearly all the reported outbreaks have been caused by smoked, pickled or canned food which has been allowed to stand for a time and eaten before cooking or after *inadequate* cooking. No cases have yet followed the consumption of fresh food, cooked or uncooked. In Europe cases have been due to sausages, ham, preserved meats, game *pâtés,* potted goose or duck and brawn. In America the contaminated foods have generally been canned fruits and vegetables. In most cases the infected food presented a noticeable change, but it may be well preserved.

The question of food-poisoning is of the utmost importance in the actual inspection of the food

and the supervision of its preparation and handling until it reaches the consumer.

Our foods are principally derived from meat, milk, fish, fruit and cereals. There are, of course, other foods, and some by-products of the foods mentioned which I shall not attempt to deal with to-night.

Bread is an important food, and the chief complaints arise from its handling subsequent to manufacture and the occasional presence of foreign bodies in it. Bread is conveyed to the household in two ways—by the breadman and through the retail shops. Can we claim that the handling in either case in general meets with approval? In my opinion there is great scope for improvement in the handling of this food. Some years ago, at least one firm manufactured bread by machinery, wrapped it in special paper and delivered it in a satisfactory state, but the consumer generally did not favour it. The wrapping of bread should receive more attention, and an important point in this regard would be the education of the manufacturer and the consumer. There are other aspects of bread as a food which are important but which I do not propose to deal with here.

Vegetables are a common and popular food which, with some exceptions, such as potatoes and preserved vegetables, should be sold in a fresh condition. Vegetables eaten raw, such as lettuces, cress and celery, require to be protected from contamination. Typhoid fever has been caused by cress from contaminated sources. Macewen describes a case where a girl contracted hydatid disease from eating lettuce containing the eggs of *Taenia echinococcus.* This parasite is common in food animals, but is not transmitted directly from meat to man, but may be transmitted indirectly through dogs. What is the position of hydatid disease in man in this country?

Fruit is also a popular food. The common saying that "an apple a day keeps the doctor away" is at least one of the causes of immense consumption of fruit. From the inspection point of view the energy has been directed to the prevention of the sale of what is called "wasted fruit." Fruit is a perishable article, and in the trade it is packed or repacked according to its condition. Although large quantities of fruit are seized, a serious obstacle in administration is the decision of the High Court of Justice that a salesmaster may sell by auction or private treaty a case or packet of fruit, a proportion of which may be damaged or wasted if he displays on his stand the following notice:—

NOTICE TO PURCHASER

"All Fruit and Produce is sold by us, whether by Auction or Private Treaty, on the condition that the price paid be regarded by the Buyer as the value of the sound goods contained in any package, whether the whole of such contents be sound or only a part thereof, and as regards such of the contents as are spoiled, damaged, or otherwise defective so as to be unfit for human consumption, such defective goods are not intended by us or purchased by the buyer for the food of man; we sell them as waste to be sorted by the buyer before offering any portion for sale."

However, taking into consideration this important decision, quantities of fruit have been seized or surrendered and a vast improvement has taken place in the condition of fruit on sale. This improvement is quite noticeable in the poorer shops and stalls in Dublin.

Fish is classified as round fish and flat fish. Round fish is divided into nine families, comprising in all 27 different fish. Flat fish are divided into four families, comprising 13 different fish. There are also shell-fish, oysters, cockles, prawns, mussels, whelks, crabs, lobsters and shrimps. Fish is usually seized on account of various stages of decomposition, sometimes due to being "spent" and occasionally when affected with diseases such as furunculosis, a disease caused by *Salmonella salmonicida;* no record of food-poisoning by this organism is available.

From the point of view of any danger of transmission of disease to man, round fish and flat fish are sound at the source, but I cannot say that they are handled in an ideal manner in the different stages before they reach the consumer. There are considerable losses in fish due to decomposition. It is important to note that fish like mackerel and herring should be sold in a very fresh condition. Place, sole, turbot, cod, haddock and such fish withstand decomposition longer.

The surroundings from which shell fish come should be under strict control. It is essential that no sewage has access to these surroundings. It is unnecessary for me to describe the danger of, say, typhoid fever from oysters obtained from sewage-contaminated sources.

It is imperative that shell-fish be handled in the most hygienic manner and be free from any evidence of decomposition. Oysters, lobsters and crabs decompose immediately after death.

Before dealing with milk and meat it is important to note that tubercle bacilli are commonly present in these foods at the source, and it is interesting to consider the effect of heat, and in the case of meat, pickling, on these bacilli.

The tubercle bacillus is resistant to external influences on account of the waxy material with which it is surrounded.

Meat is a poor conductor of heat, and consequently tubercle bacilli in it are not always destroyed by cooking, but it is interesting to note the resistance of this organism to heat.

"In a moist environment, a prolonged exposure of twelve hours at 50° C., of four hours at 55° C., one hour at 60° C., 15 minutes at 65° C., ten minutes at 70° C., five minutes at 80° C., or one minute at 95° C., is sufficient to destroy without fail the vitality of the bacillus in culture suspensions. Heat acts less rapidly on tuberculous products because of the protection afforded by the albumin. At every temperature, also, the duration of the heating is a factor of prime importance, and the degree of heat must be maintained throughout the entire mass of fluid." (Calmette.)

Bang found that heating milk to 70° C. for two minutes was sufficient to destroy tubercle bacilli, but Délépine found that heating cream to 85° C., for 15 minutes was insufficient to destroy the tubercle bacillus with certainty.

A large number of experiments have been carried out to determine the temperatures reached in the cooking of meat, and the length of time required for certain temperatures to be reached in the interior of joints, meat pies, etc.

"Rupprecht found that boiling for 45 minutes did not produce a higher temperature than 75° C., and this only in thin pieces of meat. He also determined the temperature of thoroughly boiled ham at 65° C., and sausages which are rapidly roasted attain a temperature of only 28·75° C." (Ostertag).

"Kuchenmeister found that large pieces of so-called fresh boiled pork are heated to a temperature of not more than 60° C., after the usual half-hour period of boiling; in the inner layers not more than 55° C., and require boiling for several hours in order to reach a temperature of 77° to 80° C. (Ostertag).

"Perroncito found that a piece of beef (8 by 10 cm.) placed and kept in boiling water was only 47° C., after 20 and only 68° to 70° C., after 35 minutes. A ham of about six kilos weight was placed in cold water, which was raised to boiling point. The water boiled when the interior of the ham was 25° C.; after 35 minutes it was 35° to 40° C., and after two hours the temperature in different parts of the interior were 46°, 55°, 58°, 62°, 64° and 67° C. A ham of about eight kilos weight treated in the same way showed an interior temperature of only 44·5° C., after two-and-a-half hours, while after three-and-a-half hours the temperature varied from 62° to 84° C. in different parts" (Savage).

"In connection with a food poisoning outbreak Délépine and Howart found that the temperature of the centre of a pie said to be undercooked, but having all the external appearances of being well baked, may not exceed 47·2° C. In one obviously overbaked, and acknowledged to be so, the temperature had not reached beyond 86·6° C." (Savage).

From these and other published accounts of the experiments carried out in the cooking of meat, it is evident that ordinary cooking, especially boiling or steaming, destroys tubercle bacilli in the superficial parts of joints and in thin pieces or slices of meat or organs. A regards the centre of joints or mince pies, etc., cooking does not give sufficient protection, especially in careless or rapid cooking and in what is usually known as "underdone" cooking.

Diseased organs when chopped or minced and cooked in pies, etc., would be the most likely to contain living tubercle bacilli. Also the rolled flap from an animal with tuberculous peritonitis, or joints, containing deep-seated lymph glands.

In connection with pickling, the experiments of Forester show that tubercle bacilli in cultures proved virulent after two months when covered with salt. Pieces of tuberculous organs finely minced also proved to be virulent after lying in salt brine for 18 days.

"According to Klepzon, virulent tubercle bacilli have been found in tuberculous organs after six weeks' immersion in brine." (Hutyra and Marek.)

The hanging of meat and even some degree of putrefaction have no effect on the virulence of tubercle bacilli. The virulence has been found unaffected after 167 days in decomposed cattle lung. The chilling, freezing and hanging of meat preparatory to cooking have no adverse effect on the tubercle bacillus.

Milk as a food is too big a subject to attempt to include in this short paper and I confine myself to some views on it.

Milk may be divided into high grade, pasteurised and ordinary. In this country the production of high-grade milk is more or less voluntary, although regulations controlling it are expected in the near future.

About ten years ago the production of milk was anything but satisfactory, and the ideal aimed at was under practical conditions to produce the milk from tuberculin tested cows, which was then cooled and bottled immediately and delivered to the consumer in a raw condition. Many obstacles were overcome and although the quantity is still limited the ideal has been attained. Although milk under these conditions has been improved to a very high standard, a higher aim is now demanded; this higher standard is milk produced under the best conditions from tuberculin-tested abortion-free and mastitis-free herds. In one instance at least in this country it has been found practicable for the last eleven years to produce milk from tuberculin-tested and abortion-free cows, but a mastitis-free herd has not been attained.

The necessity for tuberculin testing of cows is apparent and requires no further discussion.

With regard to contagious abortion in cattle and undulant fever in man, I do not want to underestimate the importance of the work that has been done in this subject, or to dispute the possibilities or probabilities of infection through milk. Contagious abortion in milch cows is a most serious disease in most countries. In my opinion this disease is the most serious that dairy farmers in this country as well as other countries have to contend with. Undulant fever in man, although a great deal of attention has in recent years been focused on it and a number of

cases recorded, is comparatively rare. If the recorded cases have occurred from the consumption of milk it appears that there is some factor or "missing link" as yet undetermined which is responsible for the low incidence of the disease in man in this country. I am totally in favour of abortion-free herds and believe that it is a practical proposition; but research work on the "missing link" would certainly be of much benefit. I would like to put the question here: has undulant fever in man been definitely proved to be due to the drinking of milk from abortion-infected cows?

With regard to mastitis, which is a common disease in cows, the infection of humans by the organisms that commonly cause it is rare. This remark, however, does not apply to tuberculous mastitis. The milk of cows affected with mastitis should not, of course, be used for human consumption, and its sale is prohibited under the Milk and Dairies Regulations, 1936. Although fully realising the potential danger of using milk from cows affected with mastitis, one cannot say that some cases described have been properly investigated. For a number of years I have been inoculating guinea-pigs intraperitoneally with samples of milk from sub-acute and chronic cases of mastitis, in some of which the milk was obviously changed, but in other samples no apparent change was noticeable, with the result that the mortality in the inoculated animals was negligible within four weeks; whereas with samples collected from churns and other milk utensils, similarly inoculated, the mortality rate in the guinea-pigs was very high. Indeed this rate was so high that it was found necessary to use the subcutaneous route of inoculation in a second guinea-pig. This would show that bacteria pathogenic for guinea-pigs are common in bulk samples but not in the udders of cows affected with mastitis, other than tuberculous mastitis. This experience does not prove much, but it is capable of further development.

Pasteurised milk, for various reasons, forms a large proportion of the milk consumed. Those who are familiar with this process must realise that the supervision at the source of the milk and during pasteurisation and at the subsequent handling of the milk is an essential feature. The conditions at the source must be reasonably good and the milk during pasteurisation and until it reaches the consumer calls for expert supervision and for strict regulation. In the absence of strict regulation and strict supervision, pasteurised milk may be an inferior and dangerous article. The pasteurisation plant must be of good construction and easily cleansed and sterilised and the milk heated to a temperature of 145° F., for half an hour, then immediately cooled to 50° F., and bottled into sterile bottles. From a recent description of a survey of the pasteurising plants in England, it is evident that improvements are necessary in the methods adopted.

The system which appears to me to give the best protection is the pasteurisation of the milk in the "final container."

In the supervision of milk at the source and its subsequent handling, contamination must be guarded against and for the purpose of this paper, I shall only mention enteric fever. There is abundant evidence of the seriousness of this contamination and it is caused principally in two ways—through the water supply and by the human carrier of the disease.

In the absence of a public water supply the safest water is from a deep and properly carried out boring and also properly constructed wells. In some instances the water from surface springs is safe and can be protected from contamination. Where there is any doubt it is necessary to filter the water before use. The water from deep borings and deep wells is of great service to owners of dairy farms due to the temperature of the water being low enough even in the warmest summer day to cool the milk to 60° F. When the water is affected by the atmospheric temperature the installation of a refrigerating apparatus is essential to cool the milk.

Although the human carrier is essentially a medical problem, those outside the medical profession and who are in contact with the production and handling of milk should be aware of the dangers from this source.

The field embraced by the inspection of meat and meat products is much too big and important to be dealt with in a short paper, even in a restricted manner, but the expression of some thoughts might be interesting from the point of view of discussion.

All food animals should be slaughtered under expert supervision in properly constructed slaughter houses, and the preparation of meat and meat products should be carried out under the same supervision. Some years ago, I expressed the view that the present system of slaughtering in municipal abattoirs might, with advantage, be altered to the "factory system" of slaughtering. The common method adopted in the abattoirs in this country and in England is that various butchers employ their own men: a procedure which leads to congestion, difficulty in dealing with the offal and certainly does not facilitate inspection. With the factory system such as is adopted in the bacon factories of this country, the proprietor employs a team of workers who slaughter and dress the animals and handle the offal in a mechanical fashion, under official inspection, much in the same way as the assembly of a car is carried out in a motor factory.

As I have stated earlier in this paper, I am

(*Concluded at foot of col.* 1, *page* 1278.)

The Veterinary Record

October 1st, 1938.

The Report of the Veterinary Education Committee

ALMOST unnoticed in the stress and anxiety of these eventful days, the long and eagerly awaited Report of the Inter-departmental Committee on Veterinary Education, set up jointly by the Secretary of State for Scotland and the Minister of Agriculture, was published on Tuesday last and we have reprinted in this issue the summary of its recommendations.

A perusal of this summary will show how comprehensive has been the investigation made by the Committee and how far-reaching are their recommendations. It is obvious that it would be extreme folly for us as a profession or as individuals to comment too deeply upon the Report without first reading it most carefully from end to end at least once, but preferably several times.

It is certain that this Report must be very seriously considered by everybody within the profession — by professional bodies such as the R.C.V.S., the N.V.M.A., the teaching institutions and individual members of the profession. Recommendations are made concerning the R.C.V.S., the Universities, the Veterinary Schools, the professional curriculum, clinical training and training in Veterinary Hygiene, Dietetics and Animal Husbandry, besides a host of other matters of great importance to the profession.

In later issues we shall comment upon the various matters considered by the Committee, but in view of the interest which the Report should have for individual members we confidently hope to receive for our correspondence columns a large number of letters, no doubt expressing a diversity of views.

Whatever may be the tenor of our subsequent comments—and we shall not hesitate to criticise fully the findings of the committee should we find that some of them are, in our opinion, contrary to the best interests of the profession—we can at once express our gratitude to the members of the Committee who have given so much of their time to consider problems largely concerned with our profession. Although the profession was desirous of a greater veterinary representation on the Committee, we cannot be oblivious to the fact that a report which recommends the spending of a capital sum of practically a quarter of a million pounds upon the provision of better facilities for veterinary education, together with a much increased annual expenditure, is likely to carry far more weight with the Government through being composed of a majority of members unconnected with the profession. The Committee has certainly attempted to do its task thoroughly but to the non-veterinary members the task must have been even greater than for those of our own profession. We are not unappreciative of the effort they have made on our behalf.

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The Agricultural Research Council

THE Report of the Agricultural Research Council, which we fully review in other pages, amply reflects the great extension in research on the problems of animal health and disease which has taken place since the inception of the Council. It is also evident that the Council fully realises that considerable extension in other directions, particularly with equines, pigs and poultry, is still needed and that steps to bring this extension into being will be adopted as funds and personnel become

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particularly interested in the proper ripening of meat. I believe that meat should be handled, of course with certain essential differences, as milk is in "high grade farms," and then offered for sale in a suitable "ripe" condition. Unsatisfactory conditions at the slaughterhouse, just as in the case of milk at the source, can be masked, but their ill effects can never be remedied.

The clean handling of meat-products is also of great importance to prevent outbreaks of food-poisoning. A further reason for the clean handling of meat is the provisions of the Public Health (Saorstát Eireann) (Preservatives, etc., in Food) Regulations, 1928, under which the adding of preservatives, except minute quantities of sulphur dioxide, is prohibited.

available. There are some who suggest that no thanks are due to the Council for its work in this connection as the Council has simply applied funds which were hitherto not available, in a manner that others could have done equally well. This view, to our mind, ignores the fact that in all probability such funds would never have been made available unless some body such as the Agricultural Research Council had been created. We, while believing that the profession itself could have accomplished much without the guiding influence of the Council if the funds had been available, nevertheless fully acknowledge the great help that research has received in many important ways from and through the Council. Work has been co-ordinated, investigators in similar fields have been brought together to discuss their mutual problems, funds have been allocated, individuals have been trained and research and educational institutions have been stimulated, we suggest, fairly efficiently through the operation of the Council. These are no mean gains to the profession and we would decry any effort not to acknowledge them. In lesser ways research workers receive the benefits of having an authoritative body to act as a buffer between them and harassed, and therefore impatient, Government or owners. The appreciation of the thorough but non-spectacular work done on foot-and-mouth disease, grass sickness and fowl paralysis as essential work leading to more satisfying investigations is well received by the public when a body such as the Agricultural Research Council voices it: were this task left to the individual workers or institutions more vociferous adverse criticism might be heard.

But appreciation of the work accomplished by the Council must not prevent us from recognising its deficiencies or from advocating its improvement. We hold even more firmly than heretofore that the personnel of the Council is sadly deficient in veterinary experience. We do not suggest that half of the Council should consist of veterinarians in spite of the over-riding importance to the Council of veterinary problems, but we insist that one veterinarian out of fifteen is inadequate. The profession includes many specialist workers who might easily be appointed to bring their specialised knowledge, *e.g.*, of bacteriology, to the Council Chamber and simultaneously increase the breadth of veterinary advice available. To suggest that members of the staff of veterinary colleges and institutions must not be appointed to the Council because of the conflicting interests of their particular institutions is a ridiculous suggestion, which not even the Council itself appears to accept in view of the fact that it persistently retains the services and advice of the Chairman of the Governors of one of these institutions. Adverse criticism is not infrequently levelled at the Council because of the semi-permanent character of its personnel; several members have continuously held office since the inception of the Council.

To some extent the representation of the different branches of veterinary science is better on the advisory committees of the Council, but even here we believe there is room for improvement. We would again voice the fear, however, that there is a danger—and a very real danger—of research work becoming too much the handmaiden of committees. Committees can best serve their purpose by unobtrusively facilitating the work of the investigator, by protecting him from too many extraneous worries; to achieve the best results the investigator should be worried as little as possible.

A further criticism we might voice of the work of the Council is its over-riding emphasis upon work of a "practical" nature. This not infrequently leads it to try to justify its own decisions not obviously and immediately practical by reference to opinions expressed by Ministries or Departments of Agriculture. To our mind, the ready acceptance of such support indicates a weakness in the Council itself. A body of this character, whilst rightly stressing the necessity for emphasis upon research of an applied nature, should emphatically encourage work of a fundamental character, for without such work future applied work is likely to be gravely handicapped. Almost the only reference to this necessity is to be found in the section dealing with helminths, where it is stated that "a wide fundamental investigation of nematode physiology has still to be carried out." We confess that we would like to see much increased support given to research of a fundamental character on physiological, biochemical, bacteriological, immunological and nutritional problems concerned with animal health and disease.

The Report should prove useful to the veterinary student anxious to undertake research by indicating to him some of the important branches of knowledge, *e.g.*, dairy research, wherein veterinarians might usefully collaborate with others.

REPORTS

Veterinary Education in Great Britain

The report of the Interdepartmental Committee on Veterinary Education in Great Britain has now been published [H.M. Stationery Office, price 2s. net.]

The committee was appointed in November, 1936, jointly by the Secretary of State for Scotland and the Minister of Agriculture, with the following terms of reference:—

> *To review the facilities available for veterinary education in Great Britain in relation to the probable future demand for qualified veterinary surgeons and to report thereon, and in particular to make recommendations as to the provisions which should be made from public funds in the five years,* 1937-42, *in aid of the maintenance expenses of institutions providing veterinary education.*

The personnel of the committee*was as follows: Thomas Loveday, Esq., M.A., LL.D. (Chairman); Sir Joseph Barcroft, C.B.E., M.A., F.R.S.; W. L. Burgess, Esq., M.D., F.R.C.P.(E.), D.P.H.; Sir Louis K. Kershaw, K.C.S.I., C.I.E.; John Smith, Esq., O.B.E., M.R.C.V.S., D.V.H., and W. R. Wooldridge, Esq., M.Sc., Ph.D., M.R.C.V.S., with W. R. Black, Esq., M.B.E. (Ministry of Agriculture), and W. H. McWilliam, Esq. (Department of Agriculture for Scotland) as Secretaries.

This supremely important report will be reviewed extensively in our columns in due course. In this issue, while a preliminary reference is made on our "leader" page, we otherwise limit ourselves to reproducing the following from the report:—

*The constitution of the committee at the time of its original appointment was as follows:—*Members*: Sir Thomas F. Molony (Chairman), Sir James Currie, Dr. Thomas Loveday, Sir John Robertson and Mr. John Smith, with Mr. V. E. Wilkins (Ministry of Agriculture and Fisheries) and Mr. W. N. McWilliam (Department of Agriculture for Scotland) as Joint Secretaries. Owing, however, to the lamentable deaths of Sir John Robertson and Sir James Currie, and to Sir Thomas Molony's resignation, the committee was reconstituted as now intimated, while as a result of staff changes at the Ministry of Agriculture, Mr. V. E. Wilkins was replaced by Mr. W. R. Black, as one of the Joint Secretaries.

Summary of Committee's Principal Conclusions and Recommendations

(1) A well-trained veterinary profession is an important factor of national wealth, security and health. The annual loss from diseases in farm-livestock in the United Kingdom is estimated at about £19,000,000 (paragraphs 1 to 6).

(2) The State has not contributed liberally to the training of the profession. Veterinary education has been starved. The veterinary schools are overcrowded; teaching staffs are inadequate and in some instances poorly paid; facilities for clinical and practical training are insufficient. If defects are to be made good, considerable expenditure must be faced. The system of education and courses of study also need amendment (paragraphs 7 to 10).

(3) The annual demand for newly-qualified veterinarians is estimated at about 150 during the quinquennium (1937-8 to 1941-2) and thereafter at about 115. The growth of demand has, however, exceeded expectations in the past and may do so again (paragraphs 16 to 18).

(4) There are at present four teaching schools in Great Britain—at London, Edinburgh, Glasgow and Liverpool. The University of Cambridge is also preparing to participate in veterinary education (paragraph 20).

(5) The four schools, and a school in Dublin, are affiliated to the Royal College of Veterinary Surgeons. The College does not teach, but examines, gives the licence to practise and is a disciplinary body. While it has no direct control over the schools it exercises indirect control through its examinations. The schools have no right of representation on the Council or Examination Committee of the R.C.V.S. (paragraphs 21 and 22).

(6) The relationship of the schools to Universities varies. The London School is loosely connected with London University as an institution having recognised teachers. The Edinburgh School is affiliated to Edinburgh University and the connection between the two is fairly close. The Liverpool School is a department of Liverpool University. At these three schools an increasing proportion of the students reads for degrees as well as for the Diploma of the R.C.V.S., but the additional cost of tuition and examination fees is onerous. The Glasgow School has University representatives on its Governing Body, but no other connection with the University. At Cambridge it is proposed that students shall graduate with honours and then proceed for two years to one of the veterinary schools (paragraph 22).

(7) The whole lay-out of veterinary education is disjointed and unsystematic. A more

organic connection is needed between the schools, the Universities and the R.C.V.S. (paragraphs 23 to 25).

(8) Veterinary education should be brought into closer connection with Universities. Students should have an opportunity of taking a degree in science on their way to the professional qualifications without loss of time or heavy additional fees. The Universities at Edinburgh, Glasgow, London and Liverpool are invited to consider the institution of a degree obtainable by veterinary students in the first three years of their course after study of the subjects as given in our amended curriculum for the corresponding M.R.C.V.S. examinations. Success in the degree examinations should exempt from the corresponding examinations of the R.C.V.S. (paragraphs 26 and 27; see also Chapter VIII).

(9) The R.C.V.S. should be given power to include on its Council and Examination Committee representatives of the affiliated veterinary schools and of the five Universities of Cambridge, Glasgow, Edinburgh, London and Liverpool; to send observers to examinations which exempt from its own examinations; to inspect facilities for training in animal husbandry and clinical subjects; to require from candidates for membership periods of residence on farms and with veterinary practitioners; and to appoint as full examiners for its examinations members of the Council and teachers in the affiliated schools (paragraph 29).

(10) The Act or Charter reconstituting the Council of the R.C.V.S. should provide that no further University in the United Kingdom shall be represented on the Council; aid from public funds should not be made available for veterinary teaching by any further Universities (paragraph 29).

(11) The R.C.V.S., the Universities and the veterinary schools should consult together at an early date with a view to the elaboration of a scheme for carrying into effect such of these recommendations as require agreement and joint action; and the Government should initiate such legislation as may be necessary to give effect to these recommendations (paragraph 29).

(12) The above recommendations provide a solution to most of the difficulties associated with the present one-portal system of entry into the profession, and one well suited to present conditions (paragraph 30).

(13) A sufficiency of senior posts, preferably Chairs, should be created to encourage the several branches of veterinary science (paragraph 28).

(14) The veterinary curriculum should be reorganised so as to secure such an arrangement of the subjects that the student is taken from one to another in logical sequence and that the first three years are devoted to a combination of scientific studies on which the Universities may award degrees. The proposed curriculum is set out in detail with corresponding examinations (paragraphs 41 to 46).

(15) The veterinary surgeon of the future will be more and more concerned with the maintenance of stock in health and not purely with their restoration to health. A pupilage of at least six months on a farm at varying seasons of the year should be required as a foundation of a more practical training in animal husbandry. For this training itself a field station of about 100 acres, at which the different kinds of livestock are kept, should be attached to each school. More attention should also be given to clinical study of farm livestock, and for this purpose a sufficient supply of clinical material must be available; the lack of such material is at present a serious defect in the training. Each school should possess an adequately equipped and staffed hospital for large animals, and such a hospital is best situated in the country adjoining the field station. The co-operation of practitioners should be sought in securing the needed supply of sick animals. In addition, a period of at least six months with a veterinary practitioner should be made compulsory for each student (paragraphs 31 to 40).

(16) The situation of none of the schools is ideal. The schools in Camden Town, Liverpool and Edinburgh (which are at present grant-aided) must, however, remain where they are. To maintain the required output of qualified persons a fourth school is necessary because these three Schools cannot efficiently accommodate the number of students required to produce this output, and cannot be expanded, at Liverpool on account of local conditions, in London and Edinburgh without exceeding the proper maximum size of a veterinary school dictated by the requirements of clinical instruction. The best location for a fourth school is at Glasgow, and a complete reorganisation and rebuilding of the Glasgow School is recommended (see Chapter XV). All four schools together with a proposed scheme of preclinical veterinary studies at Cambridge University should be recognised for aid from the Exchequer (paragraphs 48 to 54).

(17) The maximum numbers of students at the schools should be reduced by the end of the quinquennium to the following: Camden Town 250, Liverpool 125, Edinburgh 225, and Glasgow 200, post-diploma students and Cambridge graduates coming for clinical training to

be supernumerary to these quotas. Should future demand require it some possible expansions in these numbers are indicated to provide for an additional 100 students in all (paragraphs 52 and 53).

(18) The quality of the teaching in the schools is in many ways unsatisfactory: this is mainly due to understaffing. The scales of salary are in some cases too low in comparison with those of the State Veterinary Service and of other veterinary posts (paragraph 55).

(19) *Royal Veterinary College and Hospital.*—A field station in the country, including a hospital for large animals, is necessary; the capital cost is estimated at approximately £42,000 and a Government grant is recommended towards this cost. Schemes of staffing and salary scales are recommended; a block grant of £25,000 per annum is required in respect of the maintenance of the school during the quinquennium; and an additional maintenance grant will be needed on the establishment of the field station and hospital for large animals (paragraphs 56 to 62).

(20) *School of Veterinary Science, Liverpool University.*—This School should be developed as a school with special facilities for training in the treatment primarily of cattle and secondarily of other farm animals and poultry. The capital cost of the field station and hospital for large animals which are necessary is estimated at £36,000. The present veterinary buildings in Liverpool should be demolished and a new building erected on the present site, with extensions: the cost of the rebuilding scheme is estimated at £100,000. A Government grant is recommended towards the capital cost of the field station and the rebuilding of the main block of the school in Liverpool. Schemes of staffing and salary scales are recommended; a block grant of £8,000 per annum is required during the quinquennium and this will need to be increased when the field station is established and the school is rebuilt (paragraphs 63 to 80).

(21) *Cambridge University.*—A scheme of pre-clinical and post-clinical training at this University is recommended for Government aid. The capital cost of the scheme is estimated at £10,100 but might in certain eventualities be £16,600, towards which the University can find £4,500; a Government grant in respect of the balance of the cost is recommended. As regards maintenance costs, deficiency grants assessed departmentally are recommended up to a maximum of £900 per annum in respect of the undergraduate course and up to a maximum of £550 per annum for the diploma course (paragraphs 105 to 118).

(22) *The Royal (Dick) Veterinary College, Edinburgh.* — Recommendations are made regarding an extension of the Clinical Department of the school and other improvements of a capital nature. These will involve an increase of £36,000 in the capital cost of a building scheme previously estimated at £40,000, for which a grant on the £ for £ basis up to £20,000 from the Development Fund has been offered. A Government grant in respect of this increased cost is recommended. It is hoped that in due course a field station will be provided as recommended for other schools, and any application of the school for this purpose should receive sympathetic consideration. Schemes of staffing and salary scales are also recommended. A block grant rising to £14,000 per annum during the last three years of the quinquennium is required (paragraphs 119 to 126).

(23) *The Glasgow Veterinary College (Incorporated).*—A complete reorganisation and rehousing of this school are recommended, the University of Glasgow becoming responsible for the first three years of studies, whilst the subjects of the fourth and fifth years would be taught under the direction of the Governors of the existing College in new buildings on the outskirts of the city. A joint Board of Veterinary Studies is suggested. On condition that such a reorganisation is effected, a resumption of State assistance is recommended as from 1940-41. The capital costs of reconstruction are estimated at £40,000 for the additional buildings required at the University for the teaching of anatomy, physiology and pathology, and £39,400 for a field station and hospital for large animals on the outskirts of the city for the teaching of the animal husbandry and clinical subjects. Grant is recommended in aid of this capital scheme. A recurrent grant of the order of £12,900 per annum in the years 1940-41 and 1941-42 is recommended for maintenance (paragraphs 128 to 136).

(24) In all, a capital expenditure of £299,000 and recurring grants rising to £61,350 are involved in the above recommendations and some further small grants will be necessary when the field stations at London and Liverpool are ready for occupation. The various improvements in veterinary education which are recommended form parts of a balanced plan, the full benefit of which will be lost if the building programme is not carried out. The £ for £ principle for capital grants from the Government should not be insisted on. It should, however, be possible to raise locally part of the cost of the outstation at Glasgow. If effect is given to the proposals the cost to the State of veterinary education will be less per student than in some continental countries and the outlay would be well justified (paragraph 102).

(25) The value of advanced post-diploma courses, particularly the F.R.C.V.S., is emphasised. The D.V.S.M. has a useful place in the scheme of veterinary education and its disappearance would be unfortunate (paragraph 103).

(26) Refresher courses for veterinary practitioners are necessary in view of the rapid advances in scientific knowledge. They should be given at veterinary schools and should cover a few subjects only at a time (paragraph 105).

(27) A scheme for special courses of instruction in poultry disease control and poultry husbandry to be given jointly at Liverpool University and Harper Adams Agricultural College is approved; and grants are recommended of £300 to cover the expenditure on initial equipment, and not exceeding £750 per annum towards the net maintenance expenditure. It is also desirable that shorter intensive courses should be provided for busy veterinary practitioners who are unable to undertake a course of the length of the above joint course (paragraphs 106 to 108).

(28) The veterinary student is more likely to be successful if he comes from the farm or is the son of a practising veterinary surgeon than if he is town-bred (paragraphs 11 to 15). In the admission of students preference should be given by the schools *ceteris paribus* to students who come from farms or are the sons of practitioners: in selecting town-bred students, preference should be given *ceteris paribus* to those who have acquired experience on farms before applying for entry (paragraph 109). The number of women students admitted by the schools should be small (paragraph 110).

(29) Fees for the M.R.C.V.S. course should be not less than £40 per annum in the English and £35 per annum in the Scottish schools. Students should make their own arrangements for payment of fees to private practitioners and farmers (paragraph 111).

(30) Teachers in the schools should have time for research. Such research should be of a fundamental and disinterested nature, undertaken for the advancement of basic knowledge. Training of research workers is a post-diploma matter; existing schemes of post-graduate research scholarships are commended (paragraphs 112 and 113).

(31) The schools should not relax their efforts to secure additional income from other than State sources; some possible sources of income are indicated (paragraph 114).

(32) A special enquiry on unqualified practitioners should be instituted by the Government (paragraphs 115 to 118).

Agricultural Research Council*

Of all the recurrent reports we have to review that of the Agricultural Research Council is, in the long run, the one most vital to the progress of the veterinary profession, as in it the various lines of research on animal disease and health problems that are being actively pursued are discussed, at least in outline. A comparison of the work at present being undertaken with the position a few years ago when veterinary research was largely starved cannot fail to make the profession realise that the Agricultural Research Council has played a useful part in its development.

Although the veterinarian will be more deeply interested in the sections devoted to animal diseases, animal physiology and dairy research, he will find much of interest in those devoted to the plant side, particularly perhaps to the section on plant protection.

In the foreword to the Report it is stated that "undue mortality from disease is the most formidable problem in several branches of the farm livestock industry," so it is not surprising to read later that "of the special research grants approved by the Council during the two years from 1st October, 1935 to 30th September, 1937, more than three-fifths were directed to assist work in this sphere. Work has been supported and encouraged in the major problems of tuberculosis, brucellosis, Johne's disease, mastitis, various sheep diseases, and a beginning has been made on pig disease problems. Other important subjects such as helminth infection, sheep blowflies, fowl paralysis and certain troubles of equines are receiving greater attention and many other lines of research are being developed. The work on foot-and-mouth disease is also reviewed.

The action of the Ministry of Agriculture in laying down tests to ensure the strength, purity and specificity of tuberculin was based upon a report prepared by a sub-committee of the Council and in commenting on the Ministry's action it is stated that this step "will afford a very important protection to owners of cattle against the sale of inferior and useless preparations under the name of tuberculin." We should have liked to have seen a request for legal restriction on the sale of unsatisfactory tuberculins. Spahlinger's method of vaccination has been carefully examined, as far as the North of Ireland and Norfolk experiments are concerned, and it was decided to run another experiment on a large number of calves "if

* Report of the Agricultural Research Council for the Period October, 1935, to September, 1937. H.M. Stationery Office, London (1938). 5s. 6d. net.

Mr. Spahlinger would supply sufficient vaccine for the purpose. Mr. Spahlinger said that he would do so as soon as possible, but has not provided any so far." Following upon the early experiments at Cambridge on the use of BCG vaccine for calves, further experiments on a larger scale are in progress, from which results are expected in 1938 or 1939, and in support of this work over £6,000 was allocated. Work upon the infectivity of contaminated pastures showed that a pasture which has been occupied by cattle infected with tuberculosis is unlikely to infect fresh cattle after an interval of a few weeks. The work also suggested that infection in adolescent cattle is more commonly *via* the air passages than by the alimentary tract. Favourable reference is made to technique recently developed at Manchester for detecting tubercle baccilli in milk. In this method a rapid search is made with a low power of the microscope of a suitably prepared and stained film of a centrifuge deposit for certain special groups of cells. These are then examined with a high magnification for tubercle bacilli. It is claimed that this method gave results very nearly identical with those obtained by guinea-pig inoculation.

Much work is being carried out upon *Brucella abortus* infection in animals, mainly with a view to finding reliable methods for its eradication. At present, as 66 per cent. of herds in England are "flying herds" the extent to which "eradication" can be applied with existing knowledge is only limited. Much useful work is being accomplished in the development of immunity to this organism in guinea-pigs, preparatory to subsequent work to be undertaken with cattle at Compton. An analysis of the 373 cases of undulant fever recorded since 1930 in this country in man shows a mortality of 2·9 per cent. The disease is more serious than these figures suggest, for the average duration of fever in 259 cases was 12·6 weeks, with an addition of several weeks' convalescence.

Attempts are being continued to find a reliable test for the detection of Johne's disease, particularly in its early stages.

Several pages are devoted to reporting the work on mastitis, but one of the most important paragraphs deals with control. "It is necessary to examine the milk from mastitis cases bacteriologically if control of the disease in a herd is to be successfully undertaken, in order that slight cases of infection may be detected and all sources of infection guarded against as early as possible. . . . Since early diagnosis is so necessary the herd must be examined and the separate milks (preferably drawn from each quarter), cultured by suitable bacteriological technique, at first every month and at least every three months." Elsewhere it is reported that *Streptococcus pyogenes*, at ordinary temperatures, does not multiply in milk and so is "unlikely to be present in milk in sufficient numbers to infect man unless it has already multiplied in the cow's udder."

Useful surveys of the anaerobic diseases of sheep in Great Britain and of troubles of pigs are reported. The evidence collected pointed to a rising mortality in pigs, "which is referable in great part to the changed conditions in pig-keeping, the increase in pig population sometimes tending to overcrowding, and the increased need to obtain farrowing all the year round." The problem of pig mortality is considered to be "much wider than a purely pathological one, and that management, nutrition and heredity all play a part." It is pleasing to note that work has already begun both at Compton and elsewhere to find how these losses may be reduced.

The review of the work carried out on helminths raises the question as to their true importance in the causation of disease. It is realised that certain worms, *e.g.*, the red worm of horses, are lethal, but with others, *e.g.*, the trichostrongyles, their real *status* is doubtful. It is concluded from the review that "although many species of worm are suspected of pathogenicity, very few can be shown by controlled experiments to cause real damage to their hosts, at any rate if these are otherwise healthy and well fed." Commenting upon the control of infection it is stated that "in principle, rightly designed rotational grazing should be able to clear a flock of nematode parasites. But in practice such a result can scarcely ever be economically possible; it involves too large areas of clean land, and a very heavy expenditure of labour," and so "direct treatment of infected hosts by anthelmintics or vermifuges will always be necessary." Previously unknown intermediate or alternative hosts are still being discovered. Attempts to rear worm-free lambs on clean pastures have revealed the fact that rabbits are reservoir hosts of one of the parasites of sheep and goats, while work with poultry has shown that wild birds can act as important disseminators of gapeworm in poultry and that earthworms are important intermediate hosts.

It would be possible to continue the repetition of extracts from this report illustrating the value of the work it describes, but space considerations force us to desist. A few further outstanding points of interest include the decision of the Betting Control Board and the Council to set up a Field Hospital for the investigation of diseases of equines and the Council's conclusions arising out of an enquiry into the research on foot-and-mouth disease. "The effect upon the pace at which the investigations can be pursued of even so relatively

infrequent breakdowns (as have occurred at Pirbright) has been serious, and justifies beyond doubt all reasonable expenditure upon additional precautions. From the point of view of the prospects of inducing immunisation artificially it is encouraging to learn that in cattle, as distinct from pigs, a strong resistance to the disease over a long period is established by a natural attack." The future of this station has been dealt with and useful recommendations made. "On economic grounds, both in regard to foot-and-mouth disease and to the several other virus diseases causing heavy losses, the reviewing sub-committee did not doubt, and the Council take the same view, that the work at Pirbright Station should be continued and developed. Recommendations have been made for the further structural improvement of the Station, for the ensuring of adequate supplies of small animals for experimental purposes . . . for the reorganisation of the immediate direction of the research; and for the stabilisation of the position of the research staff itself." We are glad to learn of these recommendations for all will agree that improvement in the position of the staff is essential if good workers are to be attracted and retained.

A further section of the Report which we would have liked to review at length is that devoted to Dairy Research, but for the reasons given above we must restrict our comment to an appreciation of the way in which facilities for this research are being improved and of the useful character of the work being done.

In the field of agricultural engineering the Council's main interest during the past few years has been in grass drying and a brief review of the position of this new development shows that there were about 75 centres engaged in grass drying in 1937 and describes the machines in use and the cost of the process. Improvement in the efficiency of the dryers and more experience in the management of the land for grass drying are amongst the chief requirements for determining the potentialities and limitations of this method of avoiding the waste in allowing grass to run on to hay.

We are glad to see the text of the report fully supported in the section of animal diseases by reference to the papers published by the actual investigators but we regret that this procedure has not been generally adopted in other sections. Mention of individual workers is sometimes made in the text but we think this practice could still be usefully extended.

In conclusion we cannot do less than recommend this Report to members of the veterinary profession; it is a report which deserves careful reading and one which, we think, will amply repay such attention.

CLINICAL COMMUNICATION

Unusual Post-Mortem Findings in a Parturient Heifer

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and
R. R. TEMPLE,
Royal Veterinary College, London

A number of in-calf Friesian heifers was bought by a dealer and transported to his farm by lorry. Two days later advice was sought about one of them.

The new owner had noticed that morning that the animal was dull, off its feed and grunting. As it seemed to him to be "blown" and was passing very little faeces, he had given it some proprietary drinks, without effect.

On examination, the animal was seen to be slightly tympanitic and the continual grunting gave evidence of pain. Temperature, 103° F. On auscultation peristaltic movements were found to have ceased. Whilst under view it passed a small quantity of very stiff faeces with difficulty. The calf was thought to be due in about one month.

A tentative diagnosis of acute gastritis was given.

Gastric sedatives were administered at first, with an oily purgative later in the day, as no faeces were passed.

In the course of the next two days, the temperature dropped to 102° F. and some light brown mucoid material was passed. Pain was obviously increasing. There was still bowel stasis. The mammary glands showed signs of enlargement on the second visit. There was then a whitish mucoid discharge from the vulva. Treatment was continued on similar lines.

On the fifth day, the animal passed liquid faeces of normal colour. It was lying down most of the time and in this position pain was greater than when it was induced to get up. Temperature remained constant at 102° F.

On the eighth day vaginal examination showed that only one finger could be inserted through the cervix. Through the rectum one foot of the calf could be felt lying below and posterior to the cervix. The animal did not at any time strain. Two days later the animal died.

Post-Mortem findings. The calf had penetrated the left horn of the uterus and lay on its left side with only its hind legs remaining in the uterus. The calf's back was adherent to the wall of the dam's rumen. The forelegs and

ABSTRACTS

[Rats, Game, Birds and Insects in the Spread of Foot-and-Mouth Disease. (Trans. title.) Waldmann, O. and Hirschfelder, H. (1938.) *Berl. tierärztl. Wschr.* 230-234.]

The authors review the evidence as to the influence of the above on the spread of foot-and-mouth disease, and point out that rats have only rarely been found infected on infected premises. Although the disease will spread amongst rats kept in cages in captivity, it is argued that the experimental conditions are artificial and no such spread occurs in nature. Again, rats show little tendency to move their habitat unless disturbed, and it is not considered that spread of the disease can be ascribed to them.

Various species of deer are admittedly susceptible and the disease spreads readily in zoological gardens, but again it is held that the conditions are artificial, and attention is drawn to the very limited spread which occurred in the national parks of the U.S.A. as evidence that in natural conditions they have little susceptibility.

As regards birds, it has been found possible to establish the virus in the web of the duck's foot, but no generalisation occurs. It is possible that birds may carry the virus on their feet, but it is not the authors' view that they have much importance as carriers: the spread of foot-and-mouth disease is as often against the stream of bird migration as with it.

It has been shown that virus may survive in the intestine of *Stomoxys* for two days, and flies may have some local importance when they are very numerous, but it is pointed out that the severest epizootics have been recorded in winter when flies are scarce, and the evidence is opposed to the view that insects may be responsible for serious spread.

U. F. R.

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[Castration and the incidence of Neoplasms (Cancer en el Bovino). Piazza, C. (1936.) *Revista Med. vét.* Buenos Aires. **18.** 6. 378-397.]

A review of the current literature on cancer of man and animals, containing eight illustrations and three microphotographs. The greater part is devoted to a discussion of present-day theories (23 refs., mainly Roffo and Roussy), but a small section deals with the possible sequelae of castration affecting the genesis and development of neoplasms in horses and food animals.

The author disagrees with some authorities and confirms Tamejorh (1922) and Strong (1924) that castration is favourable for the proliferation of sarcomata. He notes the frequency of benign pigmented tumours in castrated animals. Few case records are given, but the author draws three conclusions:

(*i*) Animals suffer from "cancer."
(*ii*) The disease is largely identical with the condition observed in man.
(*iii*) Its onset, though rarely observed (one per thousand on *post-mortem*) in food animals, occurs at the approach of old age.

J. A. P.

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[Calcium and Phosphorus in the Nutrition of Growing Pigs. Theiler, Sir A., du Toit, P. J., and Malan, A. (1937.) *Onderstepoort J. Vet. Sci. and Animal Indust.* **9.** 1. 127-164.]

In experiments carried out on pigs the work of Marek and Wellman was not substantiated. It was found that despite the diet possessing an abnormal Erdalkali-Alkalizität (E.A.) the pigs grew normally and remained healthy, no significant change being observed in body weight, food consumption or bone development as long as sufficient calcium and phosphorus were present.

In the experimental group where the amount of phosphorus was low and the Ca-P ratio abnormal, severe rickets resulted. The low P content of the ration was reflected as a low inorganic phosphorus content of the serum whilst serum phosphatase became significantly higher than normal. The ash content of the bones was reduced. The rickets was apparent to the naked eye.

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head were drawn backwards, the latter being directed to the right of the calf and somewhat toward the chest. It weighed 107 lbs. and was very tympanitic.

The placenta remained in the uterus, and appeared to be fairly normal. A large quantity of brownish fluid was found in the abdominal cavity of the heifer and there was acute peritonitis, from which, presumably, death was due. The contents of the stomach and first part of the small intestine were normal. As the hair could not be easily rubbed away from the calf's skin, it was assumed to have been alive a few days before.

The calf may have penetrated the uterus when the heifer struggled during shipment. The small amount of faeces passed whilst under observation may have been due to the pressure of the liberated calf on the intestine.

It is remarkable that the heifer lived so long with this gross displacement.

In the group receiving a deficient ration of calcium with an abnormal Ca-P ratio no rickets resulted but osteoporosis was present. Neither the serum calcium nor the serum phosphatase was affected but the ash content of the bones was considerably reduced.

In the group receiving a diet low in both calcium and phosphorus, but in a normal ratio, the body-weight increase was unaffected. Microscopically the ribs of all the animals in this group showed marked bone atrophy with a suggestion of rickets in two of the four animals.

In a group receiving a sufficiency of calcium and phosphorus, but in an abnormal ratio, the body-weight, food consumption, blood and bone composition did not alter significantly.

The authors suggest that the E.A. of a ration, when sufficient P and Ca are present, is not exclusively responsible for the development or not of osteodystrophic diseases in pigs and that vitamin D may rather be the limiting factor in very many cases.

J. S.

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[**The Eradication of Bovine Tuberculosis in Australia.** (1937.) *Austral. Vet. J.* **13.** 6.]

A number of articles has been contributed to this issue dealing with the present status of tuberculosis in dairy herds in Australia and with the measures which have so far been undertaken towards eradication.

Apart from the control work which has been set in progress by the municipality of Launceston and by the Australian Capital Territory, relatively little has yet been done systematically to eradicate tuberculosis from dairy cows. It is proposed that the programme be extended in the near future and already a scheme has been formulated for New South Wales, while the Australian Agricultural Council has passed a resolution that each State should be asked to make a preliminary survey of the incidence of tuberculosis in milk supply areas at an early date. Until 1930 annual clinical examination of dairy herds was carried out in New South Wales and, although the number of clinical cases was reduced, little progress was made in eradication. According to Henry, the tuberculin test was first applied in the early years of this century and the good progress made in Government-owned herds in New South Wales was interrupted by the Great War. In 1926 a further step forward was taken with the formation of an accredited tubercle-free list and four tubercle-free areas were established. It is considered that a future eradication programme should be directed towards creating more free areas, the selection of which would depend on geographical, communal and economic interests. Larkin considers that the subcutaneous tuberculin test is the most satisfactory for general use in New South Wales where considerable distances to herds have to be travelled. On the other hand, Maunder has found the double intradermal test particularly valuable in Queensland.

S. J. E.

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[**Generalised Tuberculosis of Swine due to Avian Tubercle Bacilli.** Feldman, W. H. (1938.) *J. Amer. Vet. Med. Ass.* **92.** 5. 681-685.]

In the United States, the bacillus of avian tuberculosis is generally accepted as responsible for the majority of cases of localised tuberculosis in swine, and it is widely accepted also that the avian type of infection is essentially of a non-progressive character.

In an abattoir in the south-eastern part of Minnesota, out of 117,963 swine slaughtered in a period of eleven months, 21,246 (18 per cent.) were tuberculous and of these 89 were condemned on account of generalised tuberculosis. Thirty of these were investigated by cultural methods and by the inoculation of guinea-pigs and rabbits. In most instances tissues other than lymphatic glands were selected for study.

In 24 (92·3 per cent.) of 26 cases in which tubercle bacilli were demonstrated, the type proved to be avian and in the other two cases bovine. In four instances the results were negative.

This enquiry shows that in districts where localised infection due to the avian organism is common, it seems probable that a considerable proportion of the cases of generalised tuberculosis in swine is also due to the avian tubercle bacillus.

G. D.

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[**The Problem of Fascioliasis in Lombardy, Italy.** Vianello, G. (1937.) *Clin. vet. Milano.* **60.** 491-506.]

Losses due to liver fluke have assumed serious proportions in recent years in certain districts of Italy. Of the numerous drugs which have been proposed for the treatment of fascioliasis, carbon tetrachloride and carbon hexachloride (C_2Cl_6) stand out pre-eminently. Given in 1 c.c. doses, carbon tetrachloride is of great value for the treatment of sheep. The drug is rapidly absorbed and reaches the liver where it destroys the adult flukes. Its toxic action is due to its stimulating effect on the hepatic cells inducing them to produce an excess of bilirubin which passes into the blood stream and combines with the serum calcium. It is excreted as calcium bilirubinate. If sufficient serum calcium is not available, toxic symptoms result owing to the accumulation of bilirubin in the blood. To prevent this animals should be given

calcium salts for a few days before treatment, or at least concentrates with a high phosphorus and a low calcium content should be reduced.

Cattle are more sensitive to the action of carbon tetrachloride than are sheep and numerous deaths have been reported after the administration of this drug to cattle. Carbon hexachloride, however, appears to be relatively non-toxic for cattle and is just as effective in attacking the adult liver fluke. It is usually dissolved in tetrachlorethylene or given in capsule, but in order to reduce the cost and facilitate administration vegetable fats may be used as the vehicle. The melted fat containing the drug is solidified in moulds, each weighing 40 grammes and containing 24 grammes of carbon hexachloride.

The optimum dose is 24 grammes of the drug per 100 kilogramme body weight and the whole dose should be divided into two portions, the second being given 24 hours after the first. A narcotic effect may be produced but this rapidly passes off. In districts where the disease is prevalent annual treatment should be given.

Owing to the expense and trouble of dosing all susceptible animals, it is suggested that the application of calcium cyanamide to the pastures, ditches, etc., at the rate of 3 to 4 cwt. per acre forms a relatively cheap and efficacious means of control. It is claimed that calcium cyanamide destroys not only species of Limnoea but also the eggs, embryos and larvae of *Fasciola hepatica*.

J. A. N.

"NOTICE TO FARMERS"

We are informed that the following notice, headed as above, has been circulated to newspapers and agricultural journals in Northern Ireland by the Ministry of Agriculture for Northern Ireland:—

"Reports have reached the Ministry of Agriculture for Northern Ireland that a firm trading under the name of 'Veterinary Research Limited' is engaging in the sale in Northern Ireland of preparations for the treatment of various animal diseases including sterility, mastitis, red-water and contagious abortion.

"As the trade name of this firm is similar to that of the Ministry's 'Veterinary Research Division' it is felt that the impression may be conveyed to the public that the firm is in some way identified or connected with that Division, and that farmers purchasing the preparations retailed by the firm may believe that such had been examined and passed by the Ministry's veterinary surgeons, and that the efficacy of the preparations was guaranteed by the Ministry.

"The Ministry therefore desires to state clearly and definitely that the firm mentioned has no connection with the Ministry's Veterinary Research Division and that the Ministry does not guarantee the efficacy of any proprietary preparations nor does it undertake to check the results of treatment therewith."

REVIEW

[**The Microscope: Theory and Practice.** Beck, Conrad (c.b.e.). 264 pp. With 217 figs. (1938.) London: R. & J. Beck, Ltd., 69 Mortimer Street, W.1. (7s. 6d.)]

Mr. Conrad Beck, a member of the old established firm of microscope makers, Messrs. R. J. Beck, Ltd., is recognised as one of the leading authorities on the optics of microscopy and on the designing of microscopes. All those who have studied his previous books, *viz.*, "The Microscope: A Simple Handbook," 1921, London, and "The Microscope: Part II. An Advanced Handbook" (a sequel to "The Microscope: A Simple Handbook"), 1924, London, will know already with what erudition, conciseness and lucidity the author can expound the most intricate but essential problems connected with a subject of which he has great practical experience and obviously a very wide knowledge. Most people will probably agree that the volume at present under review combines the usefulness of the two previous publications with additional advantages. As the author points out in his introductory chapter, the microscope "is sometimes looked upon as a tool which can be employed without any knowledge of its properties or construction. This is a misconception. The information derived from its use may be incorrect and misleading if the principles on which it functions and the necessary technique for successful work are not understood. The appearances seen with high magnifying power under conditions that do not resemble those of ordinary vision require careful interpretation. This can only be accomplished by means of a knowledge of how the magnified images are produced."

Mr. Beck has evidently borne in mind the requirements of the average student or laboratory worker. He has succeeded in giving a straightforward explanation of the use of the microscope and the theory of microscopic optics without undue burdening of the text with complicated mathematical formulae and technical details.

A very sound and sufficient knowledge of the microscope and its proper manipulation can be obtained from a thorough digestion and assimilation of Chapters I, III, V and VI. In the first chapter will be found a simple description of the microscope, the essentials of the mechanical adjustments and certain characteristics of the optical parts. Particular attention is drawn to the necessity of correct centration of light by adjustment of the mirror, substage condenser, etc., the importance of correct tube length, the aperture of the objective in relation to resolution and magnification and when and

how magnification may be increased by high-power eye-pieces.

Useful and very necessary information is given also about the use and care of objectives and eye-pieces. There are probably many passages which teachers would like students to commit to memory, *e.g.*, "In moving the body of the microscope up and down to obtain the correct focus care is required, to prevent the objective being forced into contact with the object under examination, by racking it down too far. It is easy to break a valuable specimen by this means" (and also incidentally to damage the objective), and again, "It may appear absurd to mention that if a slide happens to have been placed on the stage upside down a high power objective will not focus through the slide."

Chapter III deals with aperture and resolution and Chapter V with illumination and technique, thus special points are elaborated which were briefly outlined in the opening chapter.

Chapter VI deals with different microscope stands of typical and special design and includes an account of the application of ultra-violet illumination, by means of which the power of the microscope to reveal fine detail can be greatly increased. Reference is made also to the use of ultra-violet light for fluorescent microscopy. However, some of the more recent developments in this field are not discussed.

Chapters II, which deals with the geometric optics of the microscope, IV, with the photometry of the instrument, and VII, with the testing of microscope "object glasses" (objectives), are useful for reference purposes, but are not so essential to the laboratory worker who only uses the microscope as a tool.

Bacteriologists, pathologists and zoologists seldom have to consider polarised light as applied to the microscope. The relatively simple method of studying crystals provided by the polarising microscope has, however, long been employed by the geologist, petrologist and expert on crystallography and chemists, and biochemists are making increasing use of this valuable method. Chapter VIII gives a general idea of the elements of the subject, and it makes a useful introduction to books giving a more detailed account of this type of microscopic study (such as Hartshorne and Stuart's "Crystals and The Polarising Microscope," London, 1934, Edward Arnold & Co.).

The book will prove invaluable to teachers, of medical, veterinary, and biological students, who wisely may wish to give a little more time and attention to very necessary instruction on the correct use of the microscope. The price (7s. 6d.) brings it within the reach also of all students and research workers. The many whole-time and part-time veterinary inspectors who under the new State Service will be called upon to make a more extensive use of the microscope will find it an almost indispensable addition to their libraries.

N.V.M.A. DIVISIONAL REPORTS

Scottish Metropolitan V.M.A.*

ANNUAL GENERAL MEETING AT EDINBURGH

The Annual General Meeting of the Scottish Metropolitan Division, N.V.M.A., was held in the Royal (Dick) Veterinary College, Edinburgh, on Wednesday, June 1st, 1938.

The President, Mr. H. M. Wilson, occupied the Chair, and there were also present Professor Boddie, Mr. A. Brownlie, Mr. C. B. Davidson, Professor Dryerre, Mr. W. M. Henderson, Mr. J. Ker, Professor Linton, Major J. G. McGregor, Professor Mitchell, Mr. P. Wilson, and a number of final year students.

Apologies for absence were read from Messrs. W. Jackson Young, W. Anderson, G. R. Jamieson, H. F. Downie, and G. Linton Robertson.

The minutes of the last meeting were read and approved and signed as correct.

Obituary.—The President then made reference to the death of two of the members, Dr. A. Charnock Bradley and Mr. Balfour Philp. The meeting stood for a two-minute silence in respect of their memory.

Office-bearers.—The names of the office-bearers for the year 1938-39 were then read and agreed to.

Representation of the Division on the Council N.V.M.A.—The number of representatives from this division is three. The President, the Hon. Secretary and Treasurer (*ex officio*), and another member to be nominated by the Division.

It was explained by Prof. Mitchell that the election of a member should not take the form of a mere nomination and rest at that. It was very important that Scotland should be represented in London. He had attended these meetings for the past few years and he suggested that another member should be elected to take his place, and whoever was appointed should make it a point to attend the meetings regularly. He did not mind representing the Division, but the question of expenses arose, as representatives had to meet all their own expenses. Prof. Boddie asked if there was anything to prevent the Division paying the

*Received for publication September 19th.

expenses of its representatives. Prof. LINTON said there was nothing to prevent this and proposed that the Council of the Division should consider paying the expenses of its representatives to London. This was seconded by Major McGREGOR.

Prof. MITCHELL said he would be quite willing to represent the Division should no one else be willing to go.

Finance.—The Hon. Secretary and Treasurer then read the Abstract of the Balance Sheet for the year and this was approved.

Professor LINTON moved that the Division should send a subscription of £5 5s. to the National Victoria Benevolent Fund and this was agreed to.

It was also decided to send a subscription of £10 to the Finance Committee of the Congress as a contribution towards the expenses of the "At Home" to be held on the Sunday before the Congress in Glasgow.

It was decided not to send a contribution towards defraying the expenses of reporters from this country at the International Congress at Zurich.

Treatment of Sick Animals of the Poor.—Professor MITCHELL said this was a scheme which concerned every practitioner and he did not think there was a sufficient number of members present to deal with the matter. He suggested that the Hon. Secretary take up the question and, if necessary, set up a committee.

Professor LINTON suggested that the practitioners in the east of Scotland be circularised and recommended that they should go into the matter seriously.

Papers.—The President then called on Mr. J. E. WILSON to give his paper on the Poultry Technical Committee.

Professor LINTON and Major McGREGOR spoke on the importance of the poultry industry to the veterinary surgeon and Mr. Wilson was accorded a hearty vote of thanks.

Professor DRYERRE gave a short paper on "The Liver of The Pregnant Ewe," also being accorded the grateful thanks of the members for his contribution.

J. W. BURGESS, *Hon. Secretary.*

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North of England V.M.A.*

MEETING AT NEWCASTLE-ON-TYNE

A general meeting of the above Association was held in the Agricultural Department, King's College, Newcastle-on-Tyne, on Saturday, June 18th, 1938, when there were present Mr. E. R. Callender (President), Messrs. J. J. McDowell, J. D. Peele, J. P. Pickering, J. R. Rider, J. O. Powley, T. Wilkinson, H. B. Allan, H. S. Lightfoot, R. W. Bowman, F. Christopher, J. F. Pickering, W. A. Doughty, D. Starkey, G. M. G. Oliver and the Hon. Secretary, W. Lyle Stewart. Messrs. T. B. Elphick and D. M. Cochrane attended as visitors.

The minutes of the previous meeting, having been published in the *Veterinary Record*, were taken as read and confirmed.

Correspondence.—Under correspondence, the SECRETARY reported the receipt of apologies for absence from Messrs. J. H. Taylor, W. Jackson Young, G. Atkinson and Sir Frederick Hobday. Letters were received from Mr. J. Smith and Captain Atkinson intimating that on account of their removal from the North of England they wished to tender their resignation from membership in the Division. Mr. J. O. Powley, Harrogate, also intimated his intention to resign from membership. The meeting resolved to accept the resignations of these gentlemen with regret. A letter was received from Mr. Geo. Thompson, of Barnard Castle, stating that he had already written resigning membership of the Division. Mr. Thompson's resignation was accepted by the meeting. On the instructions of the Council the Secretary sent a letter to Mr. J. W. Rider expressing the sympathy of the members during his recent illness and in his reply, Mr. Rider thanked the members and stated that he hoped soon to be quite well again. A letter was read from Messrs. W. Watson and Sons, Optical Manufacturers of London, who wrote and enclosed copies of a handbook dealing with the use and care of the microscope. These booklets were distributed among the members. Messrs. Watson stated that they would, if desired, be willing to exhibit a film lasting 40 minutes dealing with the manufacture of microscopes: their representative would be quite willing to show this film and to give a short talk in addition. The Secretary was instructed to thank Messrs. Watson and their suggestion was referred for further consideration by the Council. A letter was read from Mr. G. W. Dunkin asking for a donation to the Adrian Jones Statue Appeal Fund. The letter stated it was desired to raise a further £563 in order to move the statue to the precincts of the Royal Veterinary College. The meeting instructed the Secretary to send one guinea to this fund. A letter was read from the Chairman of the Newcastle Branch of the R.S.P.C.A. On the proposition of Mr. Rider the whole of this correspondence and relevant documents was referred to an early meeting of the Council at which Mr. Elphick should be asked to be present. This was seconded by Mr. Peele and carried by the meeting.

* Received for publication, September 5th, 1938.

The Secretary was instructed to write to Mr. H. S. Elphick expressing the sympathy of the members on hearing of his illness and assuring him of their interest and support in his present difficulty with the local branch of the R.S.P.C.A.

Council Report.—The SECRETARY reported that at a recent meeting of the Council, it was decided to conclude the special course of lectures with two lectures on diseases of swine, the first lecture to be held on June 15th, entitled "The Procedure to be Adopted in Connection with Swine Fever," and the second lecture to be held on June 18th, on the occasion of the general meeting, entitled "The Clinical Pathology and Differential Diagnosis of Swine Fever and Swine Erysipelas." The Council decided to ask the Chief Veterinary Officer to sanction the delivery of these lectures by Mr. J. O. Powley.

Nominations.—Three new members were nominated for election to the Association. The President nominated Mr. T. B. Elphick and Mr. D. M. Cochrane. Mr. H. B. Allan nominated Mr. A. B. Weir.

Lecture.—There being no elections, Mr. J. O. POWLEY delivered his lecture on "The Clinical Pathology and Differential Diagnosis of Swine Fever and Swine Erysipelas." This was illustrated by both wet and preserved specimens and was followed by a good discussion. At the conclusion a vote of thanks to Mr. Powley was proposed by Mr. J. D. PEELE, who stated that the members had derived great benefit from the lectures so willingly undertaken by Mr. Powley. There was no doubt that Mr. Powley had an excellent knowledge of swine diseases and as this is a field where knowledge seemed to be confined to a few, it was of great interest to listen to Mr. Powley's views. The vote of thanks was carried with acclamation.

Under the heading of any other business, Mr. OLIVER stated that he hoped the Council would revert to evening lectures since it was not easy for some people to get off to attend meetings commencing at 3 p.m. The President promised that this would have the attention of the Council.

There being no other business, the meeting was declared closed.

W. LYLE STEWART, *Hon. Secretary.*

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Lancashire Veterinary Association*

SUMMER MEETING AT SOUTHPORT

The Annual Summer Meeting of the Lancashire Veterinary Association was held at Southport on June 17th, 1938.

* Received for publication, September 2nd, 1938.

A luncheon was taken at the Prince of Wales Hotel, at which there was a good attendance of members and friends. Mrs. Mayall, wife of the President, was absent through illness, but he was supported by his niece, Mrs. Williamson, of Southport. After lunch, Mrs. H. R. Hewetson, of Southport, took charge of the ladies and indicated the current attractions of the resort.

A General Meeting of the Association followed luncheon.

BUSINESS

It was agreed that the minutes of the last General Meeting be taken as read.

Correspondence.—(1) Letters of resignation from: (*a*) Mr. J. O. Powley, who stated that his activities were now restricted to Yorkshire, and he would find it impossible to attend meetings of the Association. It was resolved that Mr. Powley be asked to re-consider his decision; (*b*) Mr. P. A. O'Neil, of Birkenhead; (*c*) Mr. J. Mackintosh, of Wick, and (*d*) Mr. R. Ransome Wallis, of London—all due to change of locality.

It was resolved to accept these other resignations.

(2) From the Secretary, North Midland Division, informing the Association that support would be given to Mr. T. Wilson in the R.C.V.S. Council elections.

The Secretary was instructed to acknowledge with thanks.

(3) From the Secretary, Derbyshire Division, in reply to a communication from the Lancashire Division relative to R.C.V.S. Council elections.

(4) From the Secretary, Adrian Jones Statue Appeal Fund. It was resolved that this be referred to the next Council meeting.

Nominations for Membership.—Mr. J. Holroyd, Jun., proposed Mr. T. Hey, of Leyland, and Mr. C. F. Shawcross proposed Mr. T. Scott Anderson, of Altrincham.

In the absence of further business, the meeting was declared closed.

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CLINICAL DEMONSTRATION

The PRESIDENT proposed a hearty vote of thanks to Messrs. H. R. Hewetson, M.R.C.V.S., and R. S. White, M.R.C.V.S., and H. Pearson, L.D.S., for arranging a clinical demonstration which was held at Messrs. Hewetson's establishment, 26, Princes Street, Southport. The vote of thanks was carried with acclamation.

The demonstration was as follows:—

(*a*) Nembutal and pentothal-sodium anaesthesia, indications and intravenous administration.

(*b*) The oesophagoscope.

(*c*) Use of X-rays in diagnosis by means of films and fluoroscope.

(*d*) Canine dentistry: use of special instruments for tooth extraction.

At the invitation of the President and Mrs. Mayall, tea was served at the Prince of Wales Hotel later in the day.

In the evening a number of the members and their ladies made up a party to visit the Garrick Theatre, where a very enjoyable evening was spent at the performance of "Winter Sports."

The meeting was a very pleasant and successful one.

J. C. Baird, *Hon. Secretary.*

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Eastern Counties V.M.A.*

SUMMER MEETING AT FAKENHAM

The Summer Meeting of the above Association was held at Fakenham on Wednesday, July 6th, 1938. Before the meeting, 20 members and their ladies lunched together at the Crown Hotel.

At the meeting, the President, W. H. Dennett, Esq., was in the Chair, and there were also present: Messrs. F. Blakemore, M. Bray, E. A. Burgeon, B. A. Claxton, T. Dalling, S. E. Hill, W. F. Howes, E. S. James, H. H. Leach, G. H. Leader, W. F. Loveless, H. V. Low, C. A. McGaughey, G. S. Muir, N. F. Pollock, J. E. Porrett, E. B. Reynolds, H. P. Standley, Senr., H. Swann, J. F. Thurston, P. R. Turner, and the Hon. Secretary, H. P. Standley, Junr.

The minutes of the 62nd Annual General Meeting, as published in the *Veterinary Record*, were taken as read and signed.

Correspondence.—(1) From members: Messrs. S. Bennett, W. Blomfield, D. Blyth, V. Boyle, J. D. Broome, W. J. Browning, H. Buckingham, J. Buckingham, A. F. Castle, J. Currie, W. L. Downie, J. Hammond, T. G. Heatley, Sir F. Hobday, A. J. James, T. Love, H. J. Loveless, G. Matthews, F. W. Medlock, C. T. Murphy, C. C. Nesling, W. Shipley, R. B. Smith, W. Turtill, W. Waters, R. P. Webber, P. J. Welch, W. A. Wood and W. Wortley—regretting inability to attend the meeting.

(2) From Mr. J. Reid, tendering his resignation as a member as he had left the Eastern Counties. His resignation was accepted with regret.

(3) From Major G. W. Dunkin, appealing to the Association for a donation on behalf of the Adrian Jones Statue Appeal Fund. It was decided to send a cheque for £5 5s.

New Members.—The following were elected to Membership of the Association:—Major H. V. Franklin, March; Major E. S. James, Norwich; Mr. J. R. Kerr, Bury St. Edmunds; Mr. C. A. McGaughey, Cambridge; Mr. J. G. Murray, Cambridge, and Mr. R. R. Willing, Bury St. Edmunds.

*Received for publication, September 8th, 1938.

Next Meeting.—It was decided to hold the next meeting at Cambridge in October.

Presidential Address

The President (Mr. Dennett) now gave his Address from the Chair as follows: May I commence this short address by saying how much I appreciate the honour you did me last February when you elected me President of this Association, and further what pleasure it gives my wife and myself to welcome you here to-day. I am grateful to see such a good attendance though several familiar faces are absent that we would have wished to have with us.

The difficulties of single-handed practice, ill-health and important and unavoidable business and professional appointments must, unfortunately, all take their toll no matter when or where we hold our meetings. And it must not be forgotten that our Association covers a very wide area, some of our members residing the best part of 100 miles away from us at the present moment. I do feel, however, that our attendances are very frequently not what they might be. Loyalty to one's profession, to one's Association and the undoubted benefits to be gained by meeting one's colleagues, not only to discuss professional matters but socially, should ensure much bigger meetings than we are in the habit of enjoying.

May I remind you, gentlemen, of the motto of the Royal College, *Vis Unita Fortior.* In these times it is absolutely essential that our profession should be united; if it is not, I can see the time coming—maybe in 10 or 20 years, possibly less—when what we are pleased to call the backbone of the profession, namely, the general practitioner, will "go to the wall."

May I here make an appeal to some of those gentlemen who are not present to-day; I do not mean our unavoidably absent members, I am referring to those few practitioners in the Eastern Counties—and I am pleased to think that they *are* few—who are not members of our Association. I trust they will not consider me personal when I say that I cannot understand the mentality of a practitioner who belongs neither to his branch of the N.V.M.A. nor to the parent body, and yet there are some who own allegiance to neither and do not even see our indispensable weekly paper, the *Veterinary Record.* May I ask these gentlemen to reconsider their attitude so that we can claim at least, that our *membership* is 100 per cent., though we cannot expect to achieve that figure in attendance!

The present year is possibly the most momentous one in the history of our profession. The Agriculture Act of 1938 may make or mar the whole of our future. I do not consider that this is either the time or the place to offer any criticism of the working of that Act. This year,

I take it, is in the nature of a "try out," and during that period I think the less said the better. Difficulties and grievances there undoubtedly are, and to those that have them, all I would say is "be patient and see what another year brings forth." We are all more or less "on trial," and it is up to everyone of us to give of our best and prove to the Minister that we are worthy of the confidence which he has placed in us.

I should like to take this opportunity of saying that I consider that we, in Norfolk, are particularly fortunate in the appointment of our whole-time officers. Our Divisional Inspector, Mr. Claxton, is well known to most of us and the conscientious way in which he goes about his duties is a lesson to us all, whilst his patience during the first few rather trying months is something to marvel at. His sympathy with the practitioner has been a very real help and he has been ably assisted by Mr. Webber.

Our Superintending Inspector, Major James, is perhaps not yet so well known to us, but we are delighted to welcome him here to-day and if even one half of what I have heard about him is true, there is little doubt that he is the right man in the right place.

At the same time, I am sure Major James will be one of the most eager of us to express our deep sense of loss in the continued absence from duty of Captain Broome and to wish him a very speedy restoration to good health and return to work.

I trust most sincerely that the practitioners of the country will continue to work in harmony with the Ministry, for in these days, when the Agricultural Industry is hard hit, it would be a sorry day for the veterinary profession were all Ministry work to be done by the whole-time staff. In my opinion such a happening would be little short of a calamity and would mean the denuding of the countryside of competent veterinary surgeons, whose place would be taken by more and more of the unqualified fraternity —a calamity which would be as injurious to agriculture as to our own profession.

I trust, gentlemen, that you will forgive any errors I may have made in this short address— I fear it was put together very hurriedly and is not by any means what a "Presidential Address" should be. May I conclude by thanking you all for your attention, by wishing you all the best of health and good practice. I trust some day in the future you will visit Fakenham again. (Applause.)

Poultry Lectures.—Major T. Dalling gave a few introductory remarks with reference to proposed lectures on Poultry Husbandry and Disease. He pointed out the great importance of this subject, and most strongly advised all who possibly could to attend these lectures. It was decided that the first lecture should be held at Cambridge and that the arrangements for these lectures should be left in the hands of the Committee, to which Major Dalling was co-opted.

Clinical Cases

The Hon. Secretary said he had met with a serious outbreak, in 23 heifers ranging from 9 to 18 months old, of suspected poisoning by the celery-leaf buttercup (*Ranunculus sceleratus*). The cattle were turned out on a park and the first intimation of the trouble was received on the evening of June 17th. The owner telephoned to say that one of these heifers had been found dead. A blood smear was taken from this animal with negative results. The next day, the owner 'phoned again to say that several more of the animals appeared ill and he was advised to take them home for further examination. It was then found that practically all the animals were affected, and to date nine had died. The chief symptoms were violent diarrhoea, inappetence, sinking of the eyeballs, rapid emaciation, staring coat and the animals were hide-bound and presented a generally unthrifty appearance. *Post-mortem* examination revealed extensive ulceration extending from the soft palate to the pharynx. The mucous membrane of the abomasum and the small intestine showed a similar condition to that of the mouth, but the inflammatory process was much more pronounced. Mr. F. Blakemore, of the Institute of Animal Pathology, Cambridge, kindly came down and examined the cattle, went round the park, and identified *Ranunculus scleratus* in a dry pond and in an old copper which was presumed had been used for drinking purposes. In all, on the whole park, there were not more than 100 of these plants, and it seemed remarkable that such a small quantity should cause such severe symptoms in this number of cattle.

Mr. P. R. Turner said that he came across three outbreaks which he considered due to the celery-leaf buttercup. In one case, two horses were affected, and in addition to intestinal symptoms, they had shown profuse salivation, it being impossible to administer any medicine orally. The other two cases were in cattle.

Mr. F. Blakemore said that the celery-leaf buttercup was known to contain protoanemonin, which is an exceedingly irritant substance, and no doubt gave rise to the symptoms which were attributed to the ingestion of this buttercup.

Bowls Tournament.—After the meeting, the President and Mrs. Dennett extended an invitation to members and their ladies to tea at "St. Mary's," where the Shipley Cup Bowls Tournament was contested. The winner was Mr. G. H. Leader, who beat Mr. B. A. Claxton in the final. As a result of this tournament, the sum of £10 (believed to be a record) was collected on behalf of the Victoria Veterinary Benevolent Fund. While at "St. Mary's" Mr. Dennett

showed the members a four-year-old Suffolk mare with an unusual condition of the skin over the loins and withers which one member considered to be a form of angioma.

Vote of Thanks.—Mr. E. Brayley Reynolds said it gave him much pleasure to propose a hearty vote of thanks to the President and Mrs. Dennett for the royal way in which they had entertained them. He was sure everyone had spent a most enjoyable and happy time. Mr. H. V. Low seconded this, and the proposition was carried with applause.

H. P. Standley, Junr., *Hon. Secretary.*

Notes and News

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events

Oct. 3rd.—N.V.M.A. Committee Meetings, at 36, Gordon Square: Organising, 2 p.m.; Parliamentary, 4 p.m.

Oct. 4th.—N.V.M.A. Committee Meetings at 36, Gordon Square: Veterinary Officers' and Public Health, 10 a.m.; Appointments, 11.15 a.m. Meeting of Council, N.V.M.A. at the Connaught Rooms, Great Queen Street, W.C.2.

Oct. 5th.—Meeting of the Special Consultative Committee, N.V.M.A., at 36, Gordon Square, W.C.1,, 10.30 a.m.

Oct. 5th.—R.C.V.S. Committee Meetings.

Oct. 5th.—Annual General Meeting of the Society of Veterinary Practitioners,, at 36, Gordon Square, W.C.1, 2.30 p.m. (Meeting of Council, 11.15 a.m.).

Oct. 5th.—Meeting of the Association of Veterinary Inspectors (Ministry of Agriculture and Fisheries) at 36, Gordon Square, W.C.1, 5.15 p.m.

Oct. 5th.—Meeting of the Scottish Metropolitan Division, N.V.M.A., at Royal (Dick) Veterinary College, at 2.45 p.m.

Oct. 6th.—R.C.V.S. Committee Meetings.

Oct. 6th.—Annual General Meeting of the Central Veterinary Society, Conway Hall, W.C.1, 6.30 p.m.

Oct. 7th.—Meeting of the Editorial Committee, N.V.M.A., at 36, Gordon Square, W.C.1, 4 p.m.

Oct. 7th.—R.C.V.S. Committee and **Council** Meetings.

Oct. 13th.—Meeting of the Derbyshire Division, N.V.M.A., as Sutton Bonington, 2.30 p.m.

Oct. 21st.—Meeting of the Mid-West Division, N.V.M.A., at Bath, 2.30 p.m.

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GLASGOW CONGRESS NUMBER

The next (October 8th) issue of the *Veterinary Record* will be an enlarged and illustrated number devoted to the proceedings of the 1938 Congress of the National Veterinary Medical Association of Great Britain and Ireland, recently held at Glasgow. Application for additional copies (price 1s. post free) should be made to the Editorial Representative, N.V.M.A., 36, Gordon Square, W.C.1.

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ZETLAND COUNTY COUNCIL APPOINTMENT

We desire to draw the attention of our readers to the notice relative to the above appointment appearing on advertisement page xii of this issue.

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R.C.V.S. OBITUARY

Mossinson, David, District Veterinary Officer, Affula, Palestine. Graduated Glasgow, December 13th, 1930.

Mr. Mossinson was killed in Palestine on September 14th while travelling on duty when a land mine exploded.

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ANIMALS AND AIR-RAIDS

The Royal Society for the Prevention of Cruelty to Animals have issued a pamphlet (No. 326), entitled "Animals and Air Raids," this being a preliminary attempt to give advice on measures which may be adopted with respect to horses and small animals in the event of air raids.

Quick release devices are advocated for stabled animals but it is stated that although such a device has been invented it is not a commercial proposition to manufacturers.

It is pointed out that "tear gas" has little effect on animals but the choking and blistering "gases" are likely to cause severe injury.

With birds, which are very susceptible to "gas," the only solution is to take them into "gas"-proof shelters. Dogs and cats, it is advised, should also accompany their owners to shelters unless very restive, but large establishments should have "gas"-proof kennels. "Gas"-proof stables may be provided in some cases.

It is advocated that in "gas" attacks horses on the roads should have dry sacking placed around the legs. The Society are testing a special "gas-proof" bandage for horses' legs. (The best protection obviously would be a modified Dunlop Boot.—*Editor.*)

A brief description is given of mustard and lewisite "gases." Swabbing with petrol followed by thorough washing with warm water and soap is advocated for mustard gas, care being taken not to spread the "gas" to the surrounding parts. The application for three minutes of a paste of bleaching powder and water, followed by washing, is advocated and failing this, washing with soap and water followed by repeated rinsing with water.

Eyes should be flushed with water or normal saline followed by liquid paraffin.

Scrubbing with hot water, soap and soda is recommended for lewisite, whilst the eyes should be treated as advised for mustard "gas."

Veterinary advice is advocated for lewisite burns and blisters. A warning is added concerning the use of rubber gloves, "gas" mask, and "gas"-proof clothing when dealing with lewisite.

It is advised that cats contaminated by "gas" should be destroyed.

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SCIENTIFIC FILMS: OBJECTS OF NEW SOCIETY

It has been found that there is a widespread desire to see and appreciate good documentary films, and the scientific films committee have formed a London Scientific Film Society which will give a series of shows of good scientific films to its members and their guests during the coming season. Professor Sir Frederick Gowland Hopkins, Sir William Bragg, Professor L. Hogben, and Professor Julian Huxley, are patrons of the Society and about 150 members have already joined.

The inaugural meeting of the Society was held on Friday, September 30th, at the Conway Hall, Red Lion Square, W.C., when Mr. Arthur Elton spoke on "The Scientific Film."

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"WEAVING" AMONG ANIMALS

The Special Correspondent of the *Times* to the Zoo reports that recently a visit was paid by Dr. Monika Holzapfel, of Bern University, who is working on a special branch of animal behaviour—the "weaving" and other stereotyped movements of animals under domestication and in captivity. He continues: "Everybody must be familiar with the rhythmical movements of head and neck, the bit-champing, pawing, and tail-switching in which a restless and nervous horse indulges while tethered or waiting. Dr. Holzapfel's studies have led her to extend the observations she made on horses to animals in zoos.

"The most common 'weavers' in zoos are elephants and bears. 'Dixie,' the old circus elephant at Whipsnade, is a weaver, and this head-shaking habit seems particularly common in animals which have been tethered for any great part of their lives. In fact, weaving in elephants is almost a sure sign of circus life. In bears, too, it often means that head-swingers have spent some time in a small cage, such as might be found in a menagerie. At Regent's Park one or two brown bears weave when hungry or quarrelsome, and it may be that they inhabited small cages before being turned out into their spacious playgrounds on the Mappin Terraces.

"Many animals do not weave, but plod round their cages in a stereotyped path. This habit, which often arouses sympathetic murmurs from visitors, may well be the logical outcome of a tendency to rigid pathways in the wild. It is, indeed, surprising to find how hard and fast are the beats of many free creatures, both plant and flesh eating. Among mammals, foxes and badgers tread tracks for themselves to and from their earths; sheep tread paths over rough moors which are often fit for use by man. W. H. Hudson records the case of an inquisitive armadillo whose natural curiosity was only finally frustrated by its apparent inability to leave its own track through the woods.

"Perhaps the most illuminating examples of stereotyped animal movements are shown by those emotional machines, birds. Many passerines (and others) in the breeding season surround themselves with cages as secure as the aviaries at Regent's Park—their own territories. Though some may leave them to feed, in all cases the approach to the nest—which is almost always within the territory—is along a stereotyped path. The bird flies in, lands on a favourite branch, hops to another, then to the side of the nest—and always uses the same route.

"Photographers have sometimes had occasion to alter the entrance to some hole-breeder's nest, such as that of a pied flycatcher. In one case, when a new entrance was made on the opposite side of the stump, on all subsequent visits the parent bird landed at the old one and had to find the new by trial and error. In America the nest of an acadian chickadee was once lowered 4 ft. by sawing a piece out of the stump which contained it. The bird, on its first return, actually attempted to land at the place in the air where the entrance used to be."

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COUNTERSIGNING OF PASSPORT DECLARATIONS

We are gratified to note, as indicating further official recognition of professional status, that the Royal College of Veterinary Surgeons has been added to the list of professional associations whose members are authorised to countersign the declaration to be made by an applicant for a passport.

Correspondence

Letters to the Editor should reach the Office not later than by the first post on Tuesday morning for insertion in following Saturday's issue.

All correspondence must bear the name and address of the contributor for publication.

The views expressed in letters addressed to the Editor represent the personal view of the writer only and must not be taken as expressing the opinion or having received the approval of the N.V.M.A.

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DE SENECTUTE

To the Editor of the Veterinary Record

Sir,—I note with interest that a Select Committee of the "National" has been appointed to consider the welfare of those members of the veterinary profession whose fate it is to practise their science and art in the Colonies and other parts of the British Empire overseas. This is a step in the right direction, because these unfortunate persons are, at present, "as sheep without a shepherd," and most of them being civil servants, are debarred from fighting their own battles.

One of the greatest disadvantages of official service overseas is the early, or late, age of retirement. If the age is too early, a man in the full vigour of life may be compelled to relinquish his life's work just when he has gained valuable experience, but has not saved enough to maintain an existence on his pension or to provide for his family which may be arriving at the most expensive period. Many a man who has reached the age of 50 has devoted the best years of his life in specialising in the diseases peculiar to the country or area in which he has

been working, and if he desires to practise elsewhere, his experience is of little use to him. He has to commence *de novo,* and compete in a market already filled by younger men who in his absence have established a monopoly there.

On the other hand, if he carries on until he is 55 or 60, the difficulties are even greater. All other appointments are barred to him and he is regarded as a useless has-been and unfit for further employment. True he enjoys a larger pension but even this may not be sufficient to support him and his dependants. If, then, it is difficult for the man of 50 to find a job, it is even more so for the man of 60.

There are, of course, in every service, younger men whose promotion depends upon the departure of their senior officers, and these will be in favour of early retirement—until their turn comes. Then they will find how the "shoe pinches." If salary were based upon years of service rather than on rank or title, perhaps they would be contented to let the responsibility rest with the man whose experience has best qualified him to bear it. And if he has reached the maximum scale of salary he would probably prefer to remain on that scale rather than be placed on the dole. A questionnaire through the medium of your columns might prove illuminating.

The question is a very vexed one and the committee will find it very difficult to arrive at a solution satisfactory to all. In the first place it will have to decide at what age the average scientist is "too old" to be of further use to the State. To guide it in its deliberations I venture to append a cutting taken from the current Press, from which, by a simple calculation, it will be found that the average age of nine most distinguished scientists is over 60 years.* Some of the respected gentlemen are not, and perhaps never have been, fit for overseas service, but others well over 70 are, if I may be permitted to say so without disrespect, like Johnnie Walker, "still going strong."

Therefore as one who has had bitter experience, and has discussed the matter with others in a similar plight, I would beg of the Select Committee, in its infinite wisdom and mercy, to regard this matter as one worthy of its august consideration.

I am, Sir,
Yours faithfully,
Ll. E. W. Bevan.

Office of the High Commissioner,
Rhodesia House,
Strand.

[*Our correspondent's enclosure relates to the personnel of the committee set up by the British Association for the Advancement of Science, which is to establish the machinery of the new international and social order division of the Association. The Press cutting discloses the fact that the ages of 11 of the 13 members of the committee in question range from 51 to 74 years; those of the remaining two members are not given.—*Editor.*]

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ANONYMOUS CORRESPONDENCE

To the Editor of the Veterinary Record

Sir,—I protest at Mr. Peek's suggestion that letters to the *Veterinary Record* should ever again be published without the signature of the writer.

Please protect us from any reversion to the deplorable tone of the anonymous correspondence of the past.

Yours faithfully,
J. A. Griffiths.

4, Denmark Villas,
Hove, 3.
September 24th, 1938.

DISEASES OF ANIMALS ACTS, 1894 to 1937, and AGRICULTURE ACT of 1937 (PART IV)

SUMMARY OF RETURNS

Period.	Anthrax.		Foot-and-Mouth Disease.		Parasitic§ Mange.		Sheep Scab.	Swine Fever.	
	Outbreaks confirmed.	Animals attacked.	Outbreaks confirmed.	Animals slaughtered as diseased or exposed to infection.	Outbreaks reported by the Local Authorities.	Animals attacked.	Outbreaks confirmed.	Outbreaks confirmed.	Swine slaughtered.
	No.	No.	No.	No.	No.	No.	No.	No.	No.
Period 16th to 31st Aug., 1938	19	24	3	118	—	2	9	33	40
Corresponding period in									
1937	18	23	—	—	3	4	6	26	22
1936	8	11	—	—	4	5	9	53	31
1935	10	15	—	—	3	3	13	60	40
Total 1st January to 31st Aug., 1938	580	932	160	20,376	42	72	116	443	330
Corresponding period in									
1937	490	596	19	4,473	91	129	139	748	460
1936	312	371	4	379	86	228	163	1,356	958
1935	243	285	34	10,208	84	169	227	1,314	778

Note.—The figures for the current year are approximate only. § Excluding outbreaks in Army Horses.